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Using and Maintaining the Type CS6003 Calibrator

Users Manual
UM4.6:CS6003
Original — December 1991

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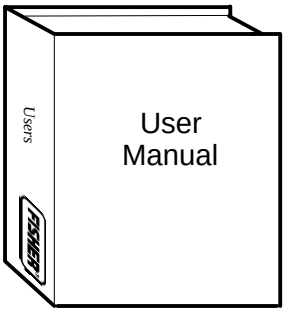
Documentation Map

Using and Maintaining the Type CS6003 Calibrator

This map shows manuals they may be need in conjunction with the Type CS6003 Calibrator. The number, title, and binder location are shown for each document, identifying where specific information is located. See the descriptions on the back of this map for more information. Section 1 lists additional related documentation.



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Using and Maintaining the Type CS6003 Calibrator

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Installing Type CP6001 Distributed MUX Input/Output File

PN4.11:DM6311
Installing Type DM6311 and DM6321 Analog Input Cards

PN4.11:DM6312
Installing Type DM6312 and DM6322 Analog Input Cards

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Installing Type DM6331 RTD Input Card

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Installing Type DM6381 Weigh Scale Interface

PN4.11:DM6411
Installing Type DM6411 and Dm6421 Analog Output Cards

PN4.11:DM6460
Installing Type DM6460-Series Discrete Output cards

Fisher documentation supports each stage of system development.

System Development Stages	Document Type & Contents
System Design	*Configuration Engineering Manuals* Configuration data-entry help for a product, including theory of operation for improved product use. *User Manual for Configuration Products* Operating methods and procedures for using the configuration software. *Technical Reference Manuals* Advanced user information for expanding the capability of the PROVOX system.
System Planning and Installation	*Installation Planning Manuals* Site preparation, including the environment, power, and grounding. Also, product input/output signal wiring, cable connections, and software installation.
System Startup and Operation	*User Manuals* Operating methods and procedures for a product. *Tutorials* Structured training for operators.
Maintenance	*Maintenance Manuals* Preventative maintenance, calibration, troubleshooting, and repair procedures.

Ordering Information — To order additional manuals, contact your local sales representative, specifying the number, title, and quantity of each document required.

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1

1 Introduction

1.1 Who Should Read This Manual

This manual is intended for maintenance personnel familiar with the PROVOX® instrumentation system.

1.2 Is This the Right Manual?

This manual describes the steps for calibration of cards in a PROVOX instrumentation system.

1.3 How to Use This Manual

If you are not familiar with the Type CS6003 calibrator first read the section on using the calibrator, then refer to the section on removing, cleaning, and installing cards in a file, and then following the calibration procedure for the type of card being calibrated.

1.4 What This Manual Contains

This document describes how to maintain the Type CP6601 Distributed MUX I/O File and its associated input/output cards. This document includes:

Section 1 — **Introduction**: describes the manual, the products included in the manual, its intended audience, and related documents

Section 2 — **Using the Calibrator**: describes in detail the front panel of the calibrator and gives the general steps on how to use the calibrator.

Section 3 — **Card Removal, Cleaning, and Installation**: describes how to remove cards from a file, how to clean the cards, and how to install the cards in a file.

Section 4 — **Input/Output Cards**: describes the calibration of the Type DM6300-Series Input and Type DM6400-Series Output Cards.

Section 5 — **Controller Cards**: describes the calibration of the Type CL6003, Type CL6011, Type CL6201, Type CL6202, Type CL7011, Type CL7311, Type CL7312, Type CN6201, Type CP7202, and Type CS6201 cards.

Section 6 — **Data Highway Cards**: describes the calibration of the Type DH7010 for PN46A4233 and PN41B0985.

Appendix A — **Maintaining the Calibrator**: describes the maintenance of the calibrator.

Glossary — Contains definitions, acronyms, and abbreviations of process-control terms

Index — Contains an index of the information in this manual

1.5 Related Documents

The documentation map at the front of this manual shows the documentation for the PROVUE® console. Additional reference documents are listed below.

- *Planning and Installation* (PN4:002)
- *Environmental Conditions for Instrumentation Systems* (PN4:006)
- *Configuring the 20-Series (SR90) Controller Family* (CE4.2:CL6623)
- *Installing the Type CP6601 Distributed MUX Input/Output File* (PN4.4:CP6601)
- *Installing the 20-Series (SR90) Controller Family* (PN4.2:CL6623/CL6625/CL6627)
- *Installing Type DM6311 and DM6321 Analog Input Cards* (PN4.11:DM6311)
- *Installing Types DM6312 and DM6322 Analog Input Cards* (PN4.11:DM6312)
- *Installing Type DM6331 RTD Input Cards* (PN4.11:DM6331)
- *Installing Type DM6341 Millivolt Input Cards* (PN4.11:DM6341)
- *Installing Type DM6350-Series Thermocouple Input Cards* (PN4.11:DM6350)
- *Installing Type DM6360-Series Discrete Input Cards* (PN4.11:DM6360)
- *Installing Type DM6371, DM6372, and DM6373 Pulse Count Input Cards* (PN4.11:DM6371)
- *Installing Type DM6411 and DM6421 Analog Output Cards* (PN4.11:DM6411)
- *Installing DM6460-Series Discrete Output Cards* (PN4.11:DM6460)

- *Installing the Type DM6001 and DM6003 Multiplexer Units* (PN4.11:DM6001)
- *Maintaining Type DM6001 Multiplexer Control Unit* (MM4.11:DM6001)
- *Maintaining Type DM6003 Multiplexer I/O File Units, DM6300-Series Input Units, and DM6400-Series Output Units* (MM4.11:DM6003)

Note

The documents are periodically revised. Confirm that a manual includes the revision level of the product before using the manual. Contact your Fisher sales office to order copies of individual manuals.

1.6 Manual Conventions

The manual uses these conventions:

- **Abbreviations** — Terms that are abbreviated are spelled out in their entirety the first time they are used, with the abbreviation following in parentheses. Thereafter, only the abbreviation is used. The glossary of this manual also contains abbreviations and explanations of the abbreviations.
- **Revision Control** — The title page lists the manual's printing date and the version number of the product this manual covers.
- **Cross References** — References to other documents give only the document name. For the document number, see the Documentation Map.

1.7 Excellence in Documentation

Fisher's goal is to provide documents that exceed your needs. Through surveys and interviews, Fisher continually evaluates its documents as part of its customer support program.

To help Fisher evaluate how well this document fills your needs, please complete the survey form included inside the back cover. If you have suggestions on ways to improve any page of the document, please mark your suggestions on the appropriate page and enclose a copy with the survey.

Fisher needs your response to evaluate how we are meeting your documentation needs. Thank you for providing the information.

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2 Using the Calibrator

This section describes the Type CS6003 Calibrator and other test equipment needed for the calibration of input/output cards, controller cards, and data highway power converter cards for a PROVOX instrumentation system.

2.1 Introduction

The Type CS6003 Calibrator is a portable test instrument which, when supported by other basic test equipment, is used to test and calibrate controller, multiplexer input/output, and power conversion cards in the PROVOX instrumentation product line. This manual contains detailed operating instructions for the calibrator and step-by-step procedures for the testing or calibration of each type of card accepted by the calibrator. Appendix A covers the testing and repair of the calibrator.

2.2 Description

The Type CS6003 Calibrator is housed in a portable case constructed of ABS plastic with a convenient carrying handle on the top of the case.

Warning

Use extreme caution when carrying the calibrator in hazardous environment areas. The band around the calibrator case is aluminum. If the aluminum comes into contact with rusted iron or steel (iron oxide), a thermite reaction can produce a very hot spark.

All controls and indicators are located on the front panel of the calibrator. The front panel is protected by a lockable cover which folds down and can be removed without tools. A storage pocket on the inside of the cover holds the ac power cord, the operator station cables, and the umbilical cables supplied with the calibrator.

2.2.1 Cables

Three operator (and display) station cables and three umbilical cables are supplied with the calibrator. The three operator station cables are used to connect the controller, indicator, and service transfer cards to their respective operator stations. Each operator station cable is two feet (0.61 m) long and consists of six twisted pairs. The cables are identical except for the pin arrangements in the connectors. Each cable is labeled. The three umbilical cables provide connections between the inputs or outputs of some cards and the calibrator. The umbilical cable labeled CONFIGURABLE is a 16 conductor ribbon cable. The umbilical cables labeled MUX DO and MUX DI/BREAKOUT are 20 conductor ribbon cables.

2.2.2 Front Panel

All controls and indicators are located on the front panel as shown in Figure 2-1. The front panel provides card test slots, cable receptacles, digital displays, light emitting diode (LED) indicators, breakout terminals for external instrument connections, switches for operating the calibrator, and an operator station case.

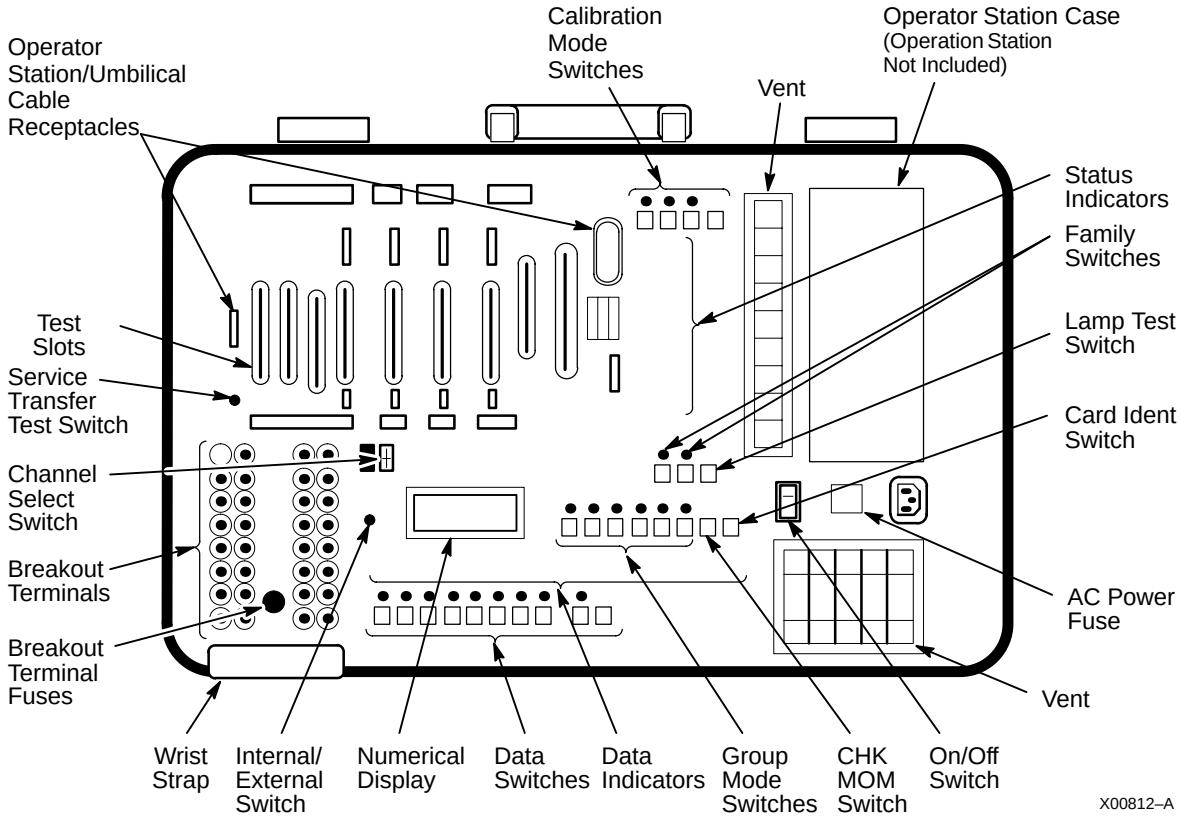


Figure 2-1. Type CS6003 Calibrator Front Panel

2.2.2.1 AC Power Cord

The ac power cord is stored with the operator station cables and umbilical cables in the pocket on the inside of the calibrator front panel cover. The ac power cord plugs into the receptacle on the calibrator front panel. The ac power cords on calibrators that operate on 100 volt or 240 volt ac power have no male connector. The user supplies a connector that matches local outlets. On these cords, the green wire is the safety ground wire.

2.2.2.2 Wrist Strap

The wrist strap helps prevent static discharges that could seriously damage cards being handled. The calibrator operator should always wear the wrist strap when handling cards.

2.2.2.3 ON/OFF Switch

The calibrator ON/OFF switch is located on the lower right section of the front panel. When activated, the calibrator does not require time to stabilize. No cards should be installed or removed from the calibrator unless the ON/OFF switch is in the OFF position.

2.2.2.4 Test Slots

There are nine test slots on the calibrator. Each test slot is formed by an edge connector and two card guides projecting from the front panel. Eight of the test slots are dedicated to a different card type. The remaining test slot is shared by several card types. Each test slot is labeled according to the cards it can hold for calibrating.

2.2.2.5 Operator Station Cable/Umbilical Cable Receptacles

There are six receptacles for cable connections. Four of the receptacles are used by the umbilical cables. One of the receptacles is used for all three operator station cables. The final receptacle, labeled DATA CONC, permits connection of the calibrator to port eight of a data concentrator to enable controller cards installed in the calibrator to be configured from a console.

2.2.2.6 Operator Station Case

An operator station case is built into the calibrator. Operator stations, indicator display stations, and service transfer display station can be installed in the operator station case when their respective cards are being tested. Operator stations are not required to calibrate the corresponding cards. A service transfer display station is required if the service transfer unit is to be functionally tested.

The operator station case on the calibrator front panel will not hold DIN standard operator or display stations. The calibrator can, however, be ordered with a DIN standard operator station case. The DIN standard case is separate from the calibrator and sits on small rubber feet. A DIN standard operator or display station mounts in the DIN standard case and the appropriate cable connects the case to the card being calibrated.

2.2.2.7 Breakout Terminals

The breakout terminals provide connections between the card being tested and external devices. Each breakout terminal is a combination binding post and standard banana jack. The numbered breakout terminals provide access to the input and output channels of the multiplexer I/O cards. The VO terminals provide connections to voltage output cards. The CO1 and CO2 terminals provide connections to the channels of current output cards. The MVI terminals allow the input of an external voltage source. On the VO, MVI, CO1 and CO2 breakout terminals, the black terminals indicate the grounded side of the pairs of terminals. The +24V and +5V terminals provide external access to internal calibrator supply voltages at a maximum of 0.1 amp for reference and logic levels. The breakout terminals labeled 250 ohm LOAD are the ends of a 250 ohm ($\pm$ 0.1 percent) resistor. Current outputs can be connected across the resistor so that they can be measured by a voltmeter.

2.2.2.8 Internal/External Switch

The switch labeled INT/EXT allows an external voltage source, input through the calibrator +MVI and –MVI breakout terminals, to replace the calibrator internal 5 volt reference. This is not required for any of the present calibration or test procedures and the switch should be in the INT position at all times.

2.2.2.9 Service Transfer Test Switch

The SVCE XFER TEST switch is used only during the functional test of a service transfer unit. At all other times the SVCE XFER TEST switch should be in the CONT OUT position.

2.2.2.10 Channel Select Switch

The CHANNEL SELECT switch determines which channel of the card being calibrated, is being viewed by the calibrator. The channel selected is displayed by a seven-segment LED.

2.2.2.11 Numerical Display

The calibrator numerical display consists of four, seven-segment LEDs. It is used to display the results of several different tests. It also displays the card identity codes of the multiplexer cards.

2.2.2.12 Family Switches

The family switches, CONT and MUX, determine which family of cards the controller family or the multiplexer family, can be calibrated. The calibrator initializes in the controller mode and the indicator on the CONT switch should illuminate when the calibrator is turned on. The switches are pressure-sensitive switches whose mechanism is built into the calibrator front panel. Built-in LED indicators illuminate when a switch is activated.

2.2.2.13 Group Mode Switches

There are five groups of multiplexer cards. Each group has a corresponding group mode switch that must be turned on before a card can be calibrated or tested. The five switches are AI1 (analog input type 1), AI2 (analog input type 2), AO (analog output), DI (discrete input), and DO (discrete output). The switches are pressure-sensitive and each is equipped with an LED indicator to show it is activated. Only one group mode switch can be on at a time.

2.2.2.14 CHK MOM Switch

The CHK MOM (check momentary) switch is used in testing discrete output multiplexer cards. Pressing the CHK MOM switch illuminates LED indicators on the discrete output card, showing which output channels have been activated. The CHK MOM switch is a pressure-sensitive switch, but has no indicator.

2.2.2.15 CARD IDENT Switch

The CARD IDENT (card identity) switch, when pressed, causes the card identity code of the multiplexer card being calibrated to be displayed on the calibrator numerical display. The CARD IDENT switch is a pressure-sensitive switch, but has no indicator.

2.2.2.16 Mode Switches

The calibration mode switches (RESET, CAL LOW, CAL HIGH, and SCAN) are used when calibrating cards in the controller family.

Pressing the RESET switch activates a card self-test in each of the controller family cards except the indicator card. While the test is in progress, the IN PROGRESS indicator on the switch is illuminated. When the test is completed, the COMPLETE indicator on the switch illuminates. The RESET switch is a pressure-sensitive switch with two LED indicators.

The CAL LOW mode allows the user to set the 0 percent (ZERO) voltage level on the analog-to-digital conversion circuit and check the 0 percent value of the analog current output. When in the CAL LOW mode, discrete outputs on the controller card are also tested. The CAL LOW switch is a pressure-sensitive switch with an LED indicator. The CAL HIGH and SPAN modes should not be entered during a procedure until the CAL LOW mode has been entered at least once.

The CAL HIGH mode allows the user to set the 100 percent (SPAN) voltage level of the analog-to-digital conversion circuit and to set the 100 percent value of the analog current output. When in the CAL HIGH mode, discrete outputs on the controller card are also tested. The CAL HIGH switch is a pressure-sensitive switch with an LED indicator to show the switch is activated.

In the SCAN mode, the controller multiplexing operation is checked, the lack of crosstalk between analog inputs is verified, and a linearity test is performed. The SCAN mode also allows any discrete inputs on the controller card to be checked. The SCAN switch is a pressure-sensitive switch with an LED indicator to show the switch is activated.

2.2.2.17 Status Indicator

There are three groups of status indicators that display the results of some of the various test procedures.

- DI STATUS indicators — consist of three LEDs that indicate the number of discrete inputs active on a card being calibrated.
- CAL STATUS indicators — display the result of a comparison between the calibrator internal 5 volt reference and a voltage present in the card being calibrated. The CAL STATUS indicators show when a potentiometer on the card being calibrated has been adjusted properly. The CAL STATUS indicators also show when the SCAN mode detects a malfunction in the card being calibrated.
- RELAY TEST/RESET TEST indicators — used only during calibration procedures for the controller and multiplexer power conversion cards.

2.2.2.18 Data Switches

The ten data switches labeled MUX DATA BYTE 1, MUX DATA BYTE 2, and MUX DO/DI OR CONTROLLER DI, are used when calibrating or testing cards in the multiplexer family. The switches simulate discrete inputs and also load data into the analog output cards. The data switches are pressure-sensitive switches with LED indicators to show when a switch is activated.

2.2.2.19 Data Indicators

The data indicators labeled MUX MS BYTE, MUX LS BYTE, MUX DO/DI, CONTROLLER DO, AND AC^2 100 INTERFACE – A/M, R/L, display up to 16 bits of output data from multiplexer cards. They are also used to examine the state of discrete outputs.

2.2.2.20 Fuses

The ac power fuse is located next to the calibrator ON/OFF switch. Calibrators that use 100 or 120 volt ac line power have a 3 A fuse; those that use 240 volt ac line power have a 1.5 A fuse. The two other fuses, located in fuse holders between the rows of breakout terminals, provide fusing for the +24V and +5V breakout terminals. Each of these fuses are rated at 1/10 A.

2.2.2.21 Vents

There are two air vents on the calibrator front panel. The square vent is an air intake and the rectangular vent is the exhaust.

2.3 Operating the Calibrator

Operating the Type CS6003 Calibrator is a simple and uncomplicated process. Before proceeding to the specific test procedures, read the following general instructions governing the operation of the calibrator.

2.3.1 General Instructions

These are general instructions to protect the calibrator and the card being calibrated and ensure that the calibrator is operated in a manner that will produce accurate calibration and testing.

2.3.2 Environment

The calibrator should be operated in an environment similar to the reference operating conditions of the card being calibrated or tested. Temperatures should be moderate and the area as free as possible from electromagnetic interference (EMI).

2.3.3 Static Discharge Prevention

Cards serviced by the calibrator can be easily damaged by static electric shock. In order to guard against this damage, always wear the calibrator wrist strap while using the calibrator and handling cards. If possible do all testing and calibrating at a static free work station.

2.3.4 Card Installation and Removal

Cards should not be installed or removed from the calibrator while the calibrator ON/OFF switch is ON. Since all of the connecting pins on the back of the card will not make contact with the edge connector on the calibrator at exactly the same time, cards can be damaged.

When installing a card in one of the calibrator test slots, follow these steps:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Position the card so that the component side of the board is on the left.

Step 3: Align the top and bottom edges of the card with the card guides.

Step 4: Slide the card into the test slot until the card seats firmly in the edge connector.

To remove a card, follow these steps:

Step 1: Ensure that the calibrator ON/OFF switch is OFF.

Step 2: **G**rasp the top and bottom edges of the card and carefully remove the card.

2.3.4.1 Lamp Test

The LAMP TEST switch on the calibrator illuminates all LED indicators and other displays on the calibrator. Before starting operation, set the calibrator ON/OFF switch to ON and press the LAMP TEST switch. All of the indicators and other displays on the front panel of the calibrator should light. If some of the indicators or displays do not light, the calibrator requires repair before proceeding with calibration or testing.

2.3.4.2 Procedures

The step-by-step procedures for testing each type of card are written in a format to indicate the results that should be obtained. In some cases, if the results obtained are not proper, corrective action is indicated. In other cases, when the proper results are not obtained after a reasonable number of attempts, the card requires other unspecified maintenance.

2.3.4.3 Test Equipment Required

Some calibrator test procedures require no test equipment other than the calibrator. Other procedures require one or more pieces of test equipment. The following list of support equipment should be available when conducting calibration and testing operations. The type of test leads required for the test equipment depends on the characteristics of the equipment being used. Generally, the voltmeter needs two test leads compatible with standard banana jacks, two test leads with mini-clips, and one test lead with a probe less than 0.08 inches (2.0 mm) in diameter. The other test equipment requires two test leads compatible with standard banana jacks.

- Voltmeter
  - Range — 0 to 30 Vdc (or more)
  - Accuracy — ± 0.1% ± 1 count
  - Resolution — 0.0002 Vdc
  - Input Impedance — 10 megohms minimum
- Voltage Source
  - Range — 0 to 10 Vdc
  - Accuracy — ± 0.02%
  - Resolution — ± 0.002 Vdc
  - Load Impedance — 10 ohms maximum
- Jumpers
  - 2 — 8 inch cross patch banana plug cords
  - 1 — 8 inch jumper with mini-clips on each end
  - 1 — 12 inch jumper with one mini-clip and one probe compatible with an 0.08 inch (2.0 mm) diameter test jack
- Millivolt Source (used for the calibration of Type DM6341 Millivolt and Type DM6351, DM6352, DM6353, DM6354, and DM6355 Thermocouple Input Units)
  - Range — –10.0 to 80.0 mV
  - Accuracy — ± 0.0005 mV
  - Resolution — 0.001 mV
  - Load Impedance — 10 ohms maximum
- 400 Ohm Resistor (used for calibration of Type CS6201 Service Transfer Unit)
  - Power Capacity — 1/4 watt
  - Accuracy — ± 0.1%
- Current Source (used for calibration of Type CS6201 Service Transfer Unit)

- Range — 0 to 20 mA
- Accuracy — ± 0.05%

- Decade Resistance Box (used for calibration of Type DM6331 RTD Input Unit)
  - Range — 0 to 200 ohms
  - Accuracy — ± 0.005 ohms
  - Resolution — ± 0.01 ohms

- Pulse Generator or Waveform Generator (used for calibration of Type DM6371 and DM6372 Pulse Count Input Units)
  - Range — 0 Hz to 10 KHz
  - Resolution — 1 Hz or better at low end and 100 Hz at top end
  - Accuracy — ± 2%
  - Amplitude — 0 to 10 Vp-p

3 Card Removal, Cleaning, and Installation

3.1 Scope

This section describes preventive maintenance procedures used with circuit cards in the PROVOX instrumentation system.

Note

Preventive maintenance procedures should be performed on a regular schedule. This schedule is dictated by the user's process, availability of backup systems, and other site specific variables.

Preventive maintenance schedules in this document require an environment maintained in accordance with guidelines given in the installation planning notes on planning the installation, and environmental conditions for instrumentation systems. If the operational environment does not meet these standards, preventive maintenance procedures should be done at a higher than recommended frequency.

3.2 Card Removal Procedure

Use the following procedure when removing the I/O cards or the buffer card from the I/O file.

Step 1: Open the front door of the cabinet containing the card being replaced.

Step 2: Make sure the system is halted.

Step 3: Remove the buffer card in the I/O file containing the card being removed.

Step 4: Remove all power to field wiring connected to the termination panel of any I/O card being removed.

Step 5: Remove and label all field wiring attached to the I/O card being removed. Remove an retain the two retaining screws on the termination panel.

Step 6: Pull out the termination panel, if used. Lift the top tab on the I/O card.

Step 7: Remove the I/O card from its slot by pulling out on the tab.

3.3 Circuit Card Cleaning

In addition to standard tools available to the technician, an ionizing air gun is recommended.

Caution

Use precaution against electrostatic discharge when installing, removing, transporting, and cleaning printed circuit cards.

Printed circuit cards should be cleaned on a quarterly basis. Cards that are dusty and do not require a solution for cleaning, can be cleaned using an ionizing air gun. The ionizing air gun uses dry, filtered, compressed air and neutralizes the static charge that causes the dust to adhere to the card. Best results are achieved with an air pressure of 20 to 30 pounds per square inch (psi).

Note

If an electrical ionizer is used, it must be periodically checked to ensure the output is a balance of positive and negative ions to avoid causing static buildup on the circuits cards. The filter (if it has one) must be kept clean. Consult the manufactures documentation for proper usage and maintenance.

Caution

Use caution not to loosen labels on ROMs mounted on the card. Also, be careful not to loosen or damage parts that are physically fragile.

Use the following steps to clean a dusty card:

Step 1: Place the card on a grounded work surface.

Step 2: Use the ionizing air gun to blow the dust off the card.

Caution

Under no circumstance should FREON™ be used as a cleaning agent for circuit cards. FREON is considered an environmental hazard and is no longer an option for cleaning.

Cleaning circuit cards that have become contaminated with oily or sticky substances require the use of a cleaning solution. It is recommended that cards requiring this process be sent to a company that specializes in the cleaning of circuit cards.

3.4 Corrosion

Printed circuit cards that have been exposed to corrosive contaminants can not be effectively cleaned. Corrosion is not a reversible process and there is no evidence that it can be totally stopped once the process has begun. In most cases, removing as much of the corrosion and associated contaminates as possible should provide some extension to the operation life of the card.

Third party reclamation companies may be able to remove most corrosion and metal migration, but the Fisher warranty will generally not be valid thereafter. If the corrosion or metal migration is severe enough, replace the card. Cleaning the card does not make them immune to corrosion and problems can be expected to resurface if the card is returned to the same environment.

3.5 Card Installation Procedure

Use the following procedure when replacing the I/O cards or the buffer card in the I/O file.

Step 1: Remove the replacement I/O card from the shipping material.

Step 2: If required, set the switches on the replacement I/O card to match the setting on the replaced card as described in section 4 of this manual.

Step 3: Ensure the system is halted.

Step 4: Slide the replacement I/O card into the slot until the edge connector engages the connector socket at the back of the I/O file and the tab snaps down. Slide the termination panel in the correct slot and install the two retaining screws.

Step 5: Connect the field wiring to the termination panel as required.

Step 6: When all other cards are installed, install the buffer card.

Step 7: Close the front door of the cabinet.

4 Input and Output Card

This section describes the procedures for calibrating the:

- DM6300-Series Input Cards
- DM6400-Series Output Cards

4.1 Type DM6300-Series — Input Cards

The following subsections give the installation information for DM6300-Series input cards.

4.1.1 Type DM6311 and Type DM6321 — Single-Ended Analog Input Cards

The single-ended analog input card is available with one of two input ranges: 1 to 5 volts dc and 0 to 10 volts dc. Depending on the application, the Type DM6311 Analog Input card can use either card version. The Type DM6321 Analog Input card uses only the 1 to 5 volt dc version. The calibration procedure refers to the card versions (1 to 5 volt and 0 to 10 volt) and not individual cards by type number.

4.1.1.1 Overview

Calibration of the single-ended analog input card consists of setting a minimum and maximum voltage input level for all eight input current levels. The 0 percent current input level is calibrated slightly above a true zero current to allow for underranging. The SPAN potentiometer controls the maximum level. Figure 4-1 shows the location of the ZERO and SPAN potentiometers on the single-ended analog input current card.

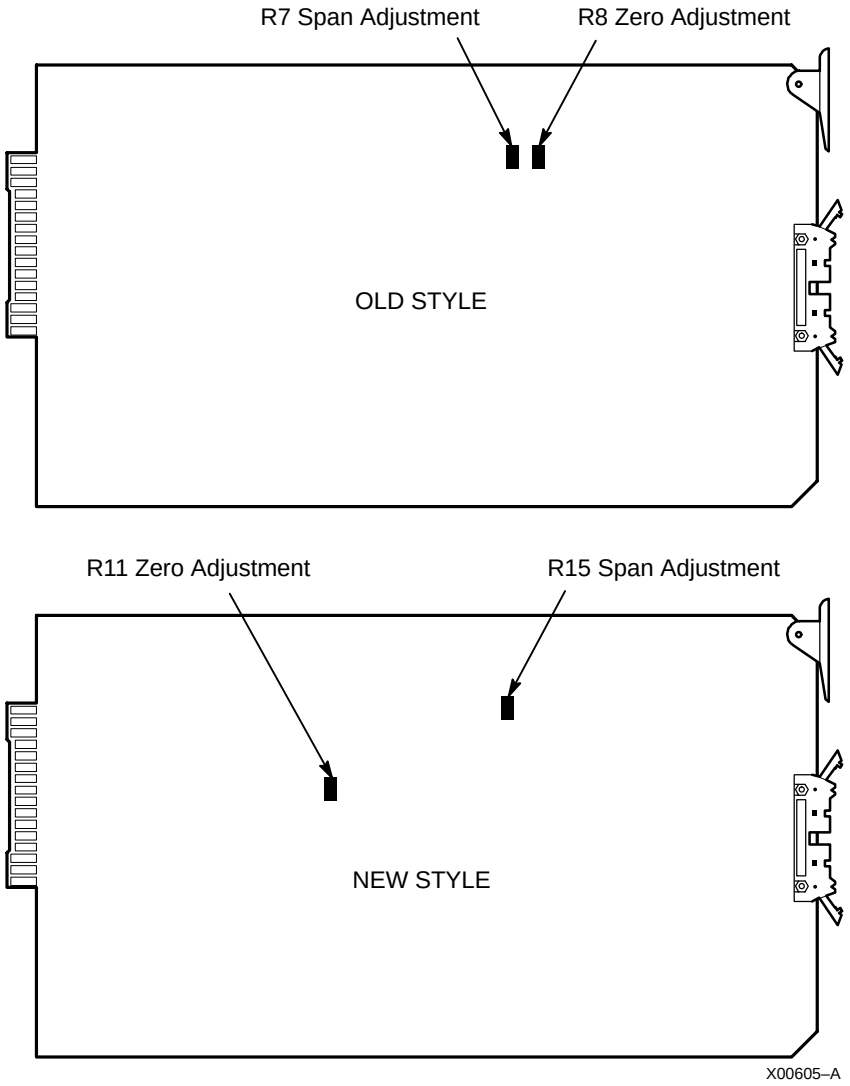


Figure 4-1. Single-Ended Analog Input Card

4.1.1.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltage Source

4.1.1.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the single-ended analog input card into the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the single-ended analog input card and the calibrator receptacle labeled BREAK-OUT CONNECTOR.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch to test the card. The calibrator numerical display shows one of the following:

- **No Code** — The card requires repair; terminate procedure and obtain a replacement card
- **0001** — The card is a 1 to 5 volt input type; continue procedure
- **0033** — The card is a 0 to 10 volt input type; continue procedure
- **Any Other Code** —The card is not a single-ended analog input card or requires repair; terminate procedure and obtain a replacement card

Step 6: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 7: Connect the voltage source between calibrator breakout terminals 1 (Channel 1 Input) and 2 (Input Common).

Step 8: Press the calibrator AI1 group mode switch.

Step 9: If the single-ended analog input card is a 1 to 5 volt input type, set the voltage source to 0.020 volts. If the single-ended analog input card is a 0 to 10 volt type, set the voltage source to 0.050 volts. Adjust the ZERO potentiometer until the calibrator numerical display reads 0016.

Step 10: If the single-ended analog input card is a 1 to 5 volt input type, set the voltage source to 5.000 volts. If the single-ended analog input card is a 0 to 10 volt input type, set the voltage source to 10.000 volts. For a 1 to 5 volt card, adjust the SPAN until the calibrator numerical display reads 4000. For a 0 to 10 volt card, adjust the SPAN potentiometer until the calibrator numerical display reads 3200.

Step 11: Repeat steps 9 and 10 until no adjustment is required for either step.

Step 12: To verify the settings, repeat steps 6 through 11 for other channels. Table 4-1 lists the correct breakout terminals for the other channels for step 7. If any tested channel does not produce a correct value and cannot be calibrated, the single-ended analog input card requires repair.

Table 4-1. Calibrator Breakout Terminal Assignments for Single-Ended Analog Input Cards

Breakout Terminal	Function
1	Channel 1 Input
2	Input Common
3	Channel 2 Input
4	Input Common
5	Channel 3 Input
6	Input Common
7	Channel 4 Input
8	Input Common
9	Channel 5 Input
10	Input Common
11	Channel 6 Input
12	Input Common
13	Channel 7 Input
14	Input Common
15	Channel 8 Input
16	Input Common
17	+24 volts
18	+24 volts
19	24 volt return
20	24 volt return

Step 13: Set the calibrator ON/OFF switch to OFF.

Step 14: Disconnect the umbilical cable and remove the single-ended analog input card.

4.1.2 Types DM6312 and DM6322 — Analog Input Cards (Isolated)

The isolated analog input card is available with one of two input ranges: 1 to 5 volts dc and 0 to 10 volts dc. Depending on the application, the Type DM6312 Analog Input card can use either card version. The Type DM6322 Analog Input card uses only the 1 to 5 volt dc version. The calibration procedure refers to the card versions (1 to 5 volt and 0 to 10 volt) and not individual cards by type number.

4.1.2.1 Overview

Calibration of the isolated analog input card consists of setting a minimum and maximum voltage input level for each of the four input

channels. The ZERO potentiometer on each channel controls the minimum level for that channel. The 0 percent voltage input level is calibrated slightly above a true zero voltage to allow for underranging. The SPAN potentiometer on each channel controls the maximum level for the channel. Figure 4-2 shows the location of the ZERO and SPAN potentiometers for each channel on the isolated input card.

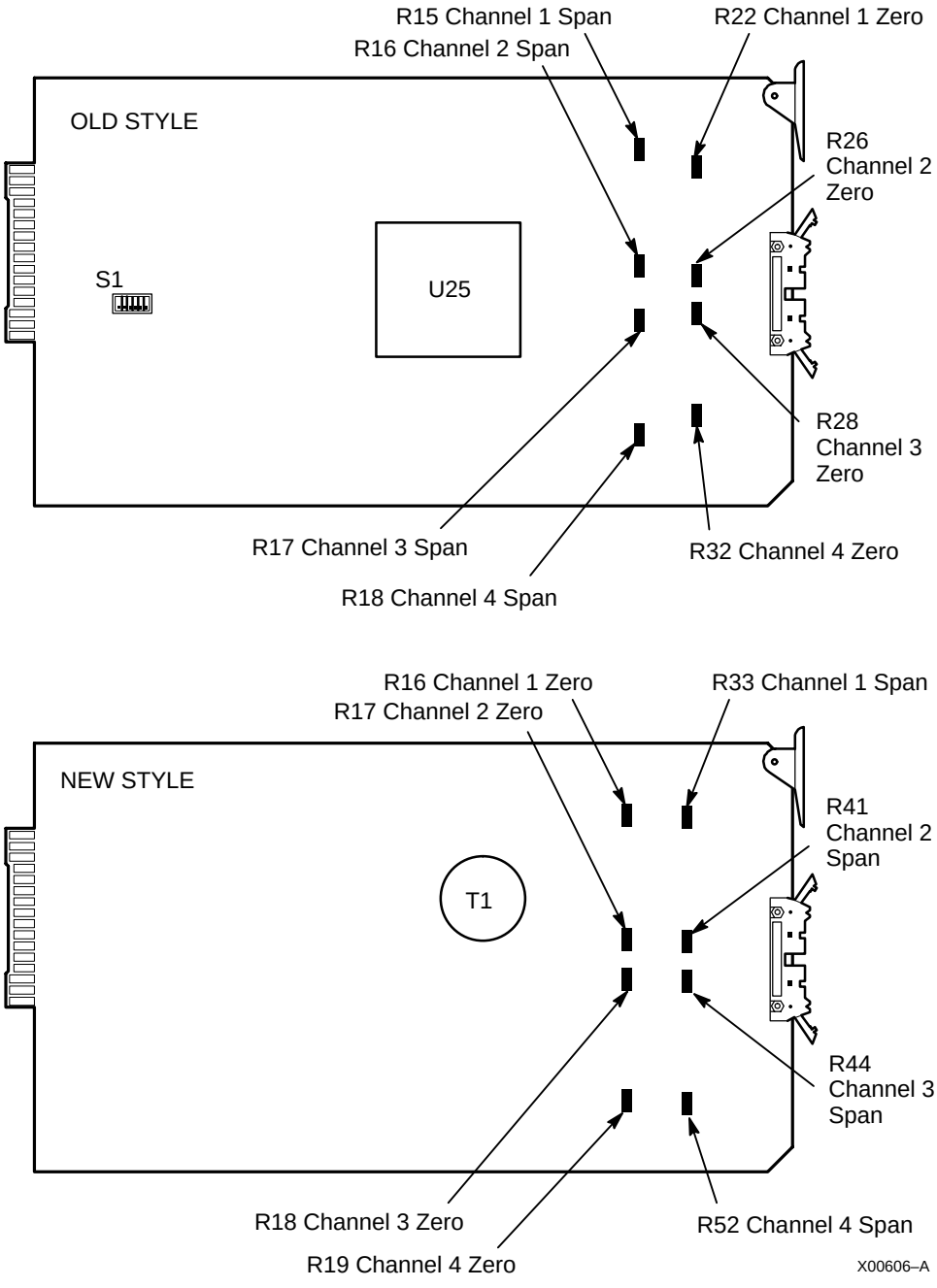


Figure 4-2. Isolated Analog Input Card

4.1.2.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltage Source

4.1.2.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the isolated analog input card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the isolated analog input card and the calibrator receptacle labeled BREAK-OUT CONNECTOR.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code —** The card requires repair; terminate procedure and obtain a replacement card
- **0011** — The card is a 1 to 5 volt input type; continue procedure
- **0012** — The card is a 0 to 10 volt input type; continue procedure
- **Any Other Code —** The card is not an isolated analog input card or requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator A12 group mode switch.

Step 7: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 8: Connect the voltage source between the positive and negative calibrator breakout terminals for the channel being calibrated (see Table 4-2).

Table 4-2. Calibrator Breakout Terminal Assignments for Isolated Analog Input Cards

Breakout Terminal	Function
1	No connection
2	Channel 2 –
3	Channel 2 +
4	No connection
5	No connection
6	Channel 1 +
7	No connection
8	Channel 1 –
9	No connection
10	No connection
11	No connection
12	No connection
13	Channel 3 –
14	No connection
15	Channel 3 +
16	No connection
17	No connection
18	Channel 4 +
19	Channel 4 –
20	No connection

Step 9: Set the voltage source to 0.020 volts dc if the card is a 1 to 5 volt dc type or 0.050 volts dc if the card is a 0 to 10 volt dc type. Adjust the ZERO potentiometer for channel 1 until the calibrator numerical display is 0016.

Step 10: Set the voltage source to 5.000 volts dc if the card is a 1 to 5 volt dc type or to 10.000 volts dc if the card is a 0 to 10 volt dc type. Adjust the SPAN potentiometer for channel 1 until the calibrator numerical display is 4000 for a 1 to 5 volt dc card or 3200 for a 0 to 10 volt dc card.

Step 11: Because the ZERO and SPAN potentiometers interact, repeat steps 9 and 10 until no further adjustment is required for either step.

Step 12: To check the channel for linearity, set the voltage source for various percentages of span listed in Table 4-3 or Table 4-4. For each voltage setting the calibrator numerical display should show the corresponding display ±0004 if the card is the 1 to 5 volt dc type or ± 0003 if the card is the 0 to 10 volt dc type. If the calibrator numerical display is incorrect, the isolated analog input card requires repair.

Table 4-3. Test Voltages for Isolated 1-5 Volt Input Card

Adjustment	% Span	Input in Volts	Numerical Display
	–25	0.000	0000
ZERO(1)		0.020	0016
	0	1.000	0800
	20	1.800	1440
	40	2.600	2080
	60	3.400	2720
	80	4.200	3360
SPAN(2)	100	5.000	4000
	103	5.119	4095

1. Zero adjustment
2. Span adjustment

Table 4-4. Test Voltages for Isolated 0-10 Volt Input Card

Adjustment	% Span	Input in Volts	Numerical Display
	0	0.000	0000
ZERO(1)		0.050	0016
	20	2.000	0640
	40	4.000	1280
	60	6.000	1920
	80	8.000	2560
SPAN(2)	100	10.000	3200

1. ZERO adjustments:

   OLD STYLE: use R22 for channel 1, R26 for channel 2, R28 for channel 3, and R32 for channel 4

   NEW STYLE: use R16 for channel 1, R17 for channel 2, R18 for channel 3, and R19 for channel 4

2. SPAN adjustments:

   OLD STYLE: use R15 for channel 1, R16 for channel 2, R17 for channel 3, and R18 for channel 4

   NEW STYLE: use R33 for channel 1, R41 for channel 2, R44 for channel 3, and R52 for channel 4

Step 13: Repeat steps 7 through 12 for channels two through four.

Step 14: Disconnect the voltage source.

Step 15: Turn the calibrator power OFF.

Step 16: Disconnect the umbilical cable and remove the isolated analog input card.

4.1.3 Type DM6331 RTD Input Card — Resistance-temperature Detector

The RTD input card is available in six temperature ranges. The calibration steps are the same for all card versions.

4.1.3.1 Overview

Calibration of the RTD (resistance-temperature detector) card consists of setting a minimum and maximum input level resistance and checking linearity for each of four input channels. The ZERO potentiometer on each channel controls the minimum level for that channel. The minimum input resistance is set slightly above a true 0 percent level to allow for underranging. The SPAN potentiometer on each channel controls the maximum level for that channel. Figure 4-3 shows the location of the ZERO and SPAN potentiometers for each channel on an RTD input card.

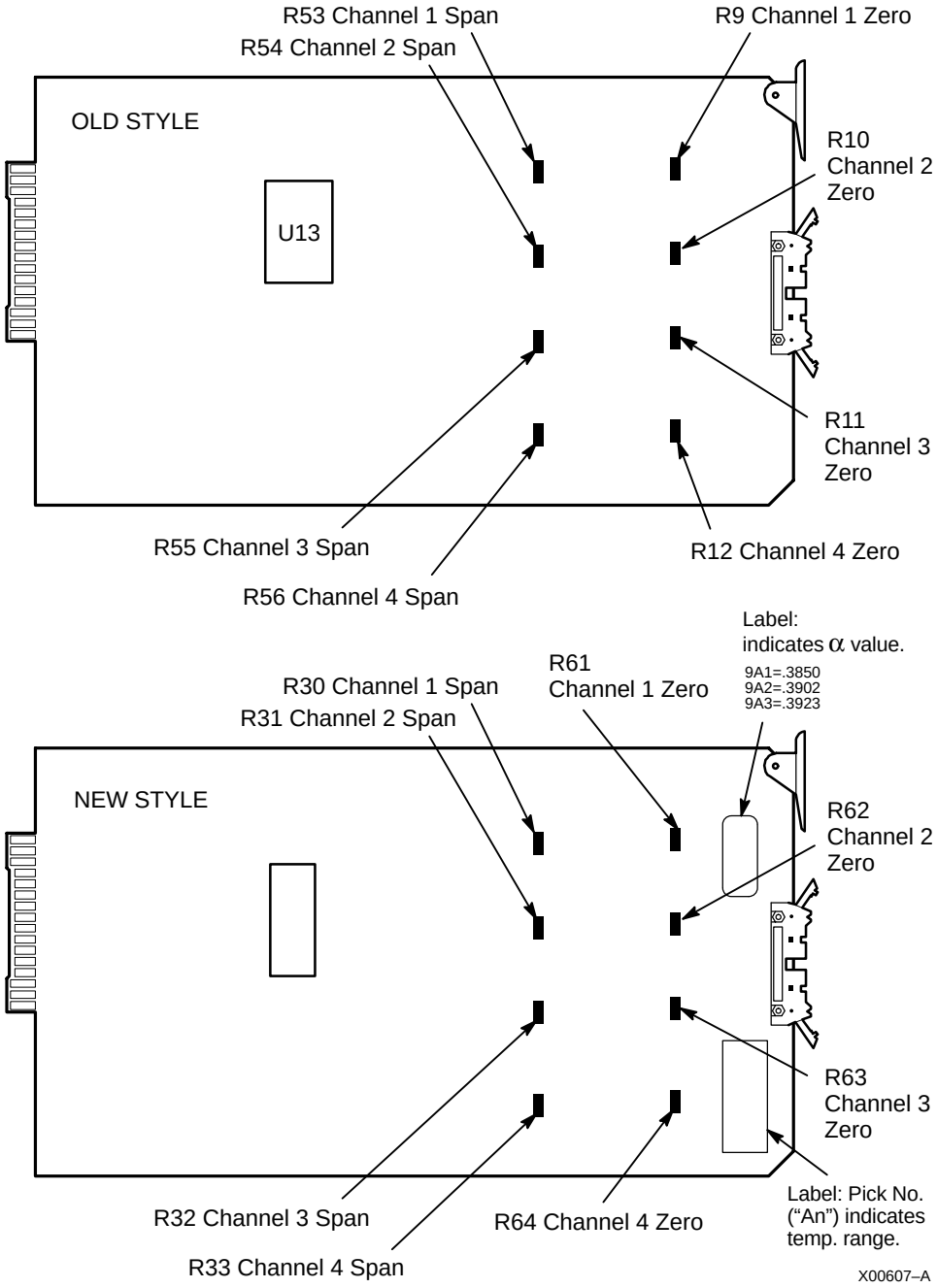


Figure 4-3. RTD Input Card

Table 4-5 lists the temperature ranges and corresponding values of R1, R2, and R3 for the RTD card.

Table 4-5. Resistor Values for Various Temperature Range RTD Cards

Temperature Range		Resistor Value			
°F	°C	R1 (Ohms)	R2 (Kilohms)	R3 (Kilohms)	Pick No.
–50 to 200	–46 to 93	60.1	5.90	560	A1
100 to 500	36 to 260	100	8.87	360	A2
0 to 1000	–17.8 to 537.8	79.6	19.6	137	A7(1)
1 to 300	–17.8 to 148.9	79.6	6.49	449	A4
–330 to 140	–201.1 to 60	3.01	10.5	243	A5
–100 to 600	–73.3 to 315.6	61.9	14	285	A6

1. Old style pick was A3 and had different resistance values.

4

4.1.3.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Decade Resistor

4.1.3.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the RTD input card in the calibrator test slot labeled MUX.

Step 3: Connect the RTD termination card to the connector on the front of the RTD input card.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code** — The card requires repair; terminate procedure and obtain a replacement card
- **0024** — The card has a temperature range of -50°F to 200°F; continue procedure
- **0025** — The card has a temperature range of 100°F to 500°F; continue procedure
- **0026** — The card is a special temperature range RTD card; continue procedure
- **Any Other Code** — The card is not an RTD card or it requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator AI1 group mode switch.

Step 7: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 8: Using the terminal assignment list in Table 4-6, jumper between the channel 1 negative and input common breakout terminals. Connect the decade resistor between the positive and negative input terminals for channel 1 on the RTD termination panel. For accurate calibration, keep all test lead connections tight.

Table 4-6. Terminal Assignments for RTD Input Card Termination Panel

Breakout Terminal	Function
1	Channel 1 +
2	Input Common
3	Channel 1 –
4	No Connection
5	Channel 2 +
6	Input Common
7	Channel 2 –
8	No Connection
9	Channel 3 +
10	Input Common
11	Channel 3 –
12	No Connection
13	Channel 4 +
14	Input Common
15	Channel 4 –
16	No Connection
17	+24 volts
18	+24 volts
19	24 volt return
20	24 volt return

Step 9: Use the label on the card to identify the card temperature coefficient and, for the special temperature ranges, the temperature range. Identify on Table 4-7, the correct set of resistance values to use with your card. Set the decade resistor to the resistance indicated for the 0.5 percent of span. Adjust the ZERO potentiometer for channel 1 until the calibrator numerical display is 0016.

Table 4-7. Test Resistances for RTD Input Cards

Temp. Coefficient ohms/°C	Adjustment	% Span	Resistance in Ohms by Temperature Range in °F						Numerical Display
			–50 to 200	100 to 500	0 to 300	–330 to 140	100 to 600	0 to 1000	
0.3850		0	82.01	114.68	93.01	18.06	70.95	93.01	0000
	ZERO(1)	0.5	82.29	115.11	93.34	18.61	71.73	94.11	0016
		20	93.01	131.74	106.06	40.09	101.74	135.97	0640
		40	103.90	148.57	118.97	61.55	131.74	177.48	1280
		60	114.68	165.17	131.74	82.55	161.04	217.55	1920
		80	125.37	181.55	144.38	103.04	189.65	256.20	2560
	SPAN(2)	100	135.97	197.69	156.90	123.24	217.55	293.43	3200
0.3902		0	81.83	114.88	92.94	16.56	70.61	92.94	0000
	ZERO(1)	0.5	82.11	115.31	93.27	17.13	71.40	94.05	0016
		20	92.94	132.17	106.15	39.24	101.76	136.46	0640
		40	103.96	149.23	119.22	61.05	132.17	178.52	1280
		60	114.88	166.06	132.17	82.28	161.87	219.15	1920
		80	125.71	182.65	144.99	103.08	190.86	258.32	2560
	SPAN(2)	100	136.46	199.02	157.67	123.55	219.15	296.05	3200
0.3923		0	81.72	114.96	92.90	16.57	70.44	92.90	0000
	ZERO(1)	0.5	82.00	115.40	93.23	17.14	71.23	94.01	0016
		20	92.90	132.34	106.18	39.06	101.77	136.65	0640
		40	103.98	149.49	119.33	60.87	132.34	178.95	1280
		60	114.96	166.41	132.34	82.17	162.20	219.81	1920
		80	125.85	183.10	145.23	103.10	191.35	259.25	2560
	SPAN(2)	100	136.65	199.55	157.98	123.68	219.81	297.24	3200

1. Zero adjustment
2. Span adjustment

Step 10: Set the decade resistor to the 100 percent of span resistance level listed in Table 4-7. Adjust the SPAN potentiometer for channel 1 until the calibrator numerical display is 3200.

Step 11: Repeat steps 9 and 10 until no adjustment is required for either step.

Step 12: Perform a linearity check for channel 1. Set the decade resistor to the various resistance levels listed in Table 4-7 for your card, and observe the calibrator numerical display. Verify that for each resistance, the display is within ±0002 of the required number listed in the table. If any incorrect numerical display appears, the RTD input card requires repair.

Step 13: Repeat steps 7 through 12 for input channels two through four.

Step 14: Disconnect the decade resistor.

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Remove the RTD input card.

4.1.4 Types DM6341 Millivolt and DM6351, DM6352, DM6353, DM6354, and DM6355 Thermocouple Input Cards

The Type DM6341 Millivolt Input Card and the DM6350-Series Thermocouple Input Cards use a similar isolated low-level analog input card. The basic calibration steps are the same for all of these cards.

Note

Because of the extremely small, accurate voltages required for isolated low-level analog input card calibration, perform the procedure only in a highly controlled environment. Minimize the effect of, or eliminate, all external power supplies, motors, fluorescent lights, and other sources of electromagnetic interference.

4.1.4.1 Overview

Calibration of isolated low-level analog input cards consists of setting a minimum and maximum voltage input level for each of the four input channels and checking circuit linearity. The ZERO potentiometer controls the minimum level. The 0 percent level is calibrated slightly above a true zero voltage to allow for underranging. The SPAN potentiometer controls the maximum level. Figure 4-4 shows the location of the ZERO and SPAN potentiometers for each channel on a low-voltage analog input card.

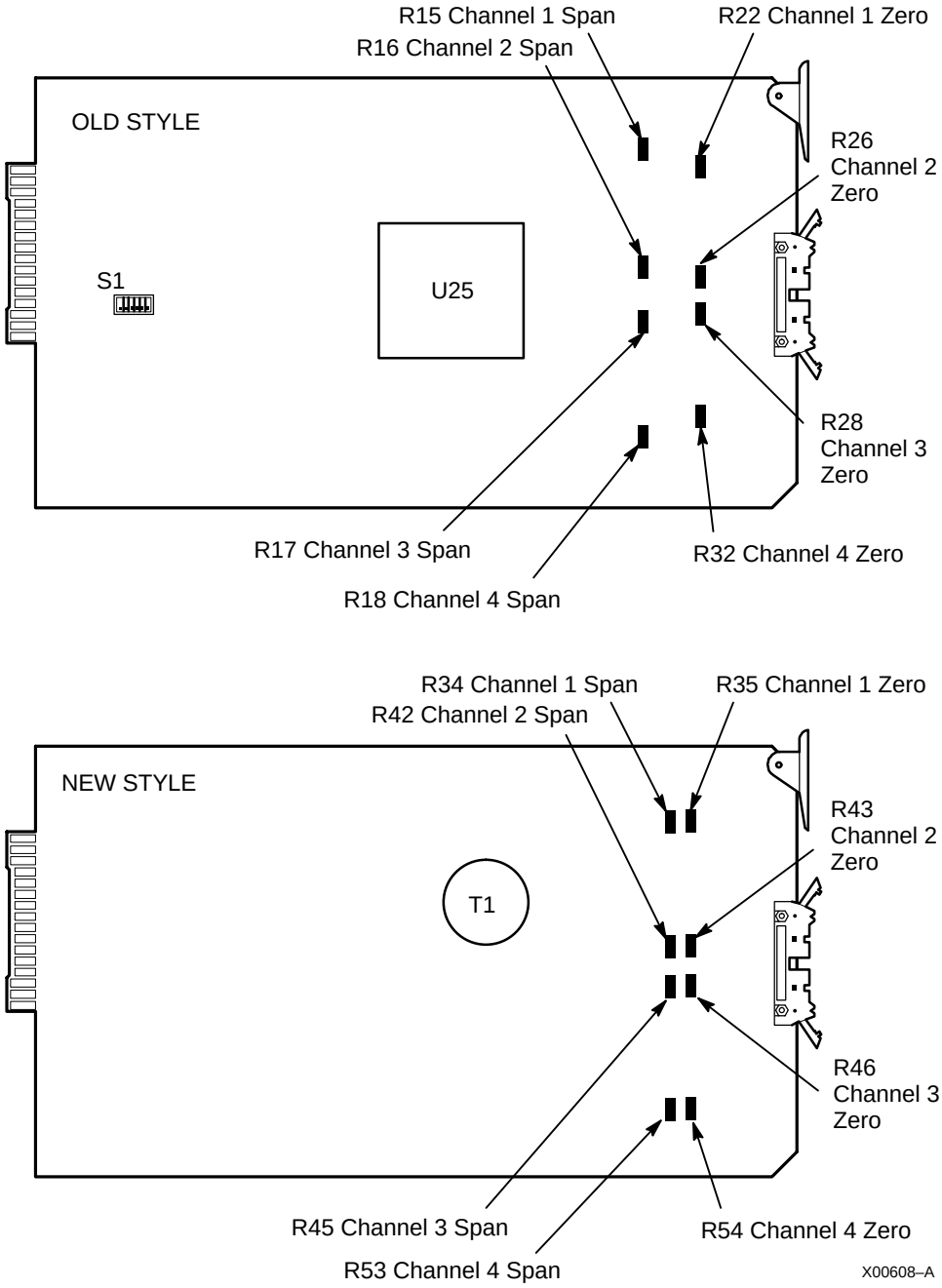


Figure 4-4. Isolated Low-Level Analog Input Card

4.1.4.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Millivolt Source

4.1.4.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the isolated low-level analog input card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the isolated low-level analog input card and the calibrator receptacle labeled BREAK-OUT CONNECTOR.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display should show the card identification code corresponding to the type of card being calibrated, as listed in Table 4-8. Verify the card type and go to step 6.

If no card identification code appears, the isolated low-level analog input card requires repair. If a card identification code appears, but is in Table 4-8, then the card is not an isolated low-level analog input card, or requires repair. In either case, terminate the calibration procedure and obtain a replacement card.

Table 4-8. Isolated Low-Level Analog Input Card Identification Codes

Card Type	Range	Identification Code
Millivolt input	–10 to 70 mV	0016
Type J thermocouple	–60° to 640°F	0034
	0° to 1400°F	0035
Type K thermocouple	0° to 2300°F	0036
	0° to 1000°F	0037
Type T thermocouple	–300° to 600°F	2720
Type E thermocouple	–100° to 1600°F	3360
Type R thermocouple	0° to 3200°F	0040

Step 6: Press the calibrator A12 group mode switch.

Step 7: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 8: Connect the millivolt source between the positive and negative calibrator breakout terminals for channel 1, listed in Table 4-9.

Table 4-9. Calibrator Breakout Terminal Assignments for Isolated Low-Level Analog Input Cards

Breakout Terminal	Function
1	No connection
2	Channel 2 –
3	Channel 2 +
4	No connection
5	No connection
6	Channel 1 +
7	No connection
8	Channel 1 –
9	No connection
10	No connection
11	No connection
12	No connection
13	Channel 3 –
14	No connection
15	Channel 3 +
16	No connection
17	No connection
18	Channel 4 +
19	Channel 4 –
20	No connection

Step 9: Table 4-10 lists the test voltage levels for the millivolt and thermocouple input cards. Set the voltage source to voltage level for 0.5 percent of span, as indicated in the table for the input card type. Adjust the ZERO potentiometer for channel 1 until the calibrator numerical display fluctuates between 0016 and 0017.

Table 4-10. Test Voltages for Low-Level Analog Input Cards

Adjustment	% Span	Millivolt Input	Test Voltages in Millivolts: Thermocouple Input by Type and Temperature Range in °F — J: –60 to 640	J: 0 to 1400	K: 0 to 2300	K: 0 to 1000	T: –300 to 600	E: –100 to 1600	R: 0 to 3200	Numerical Display
	0	–10.000	6.843	8.441	6.641	6.641	1.195	6.328	0.850	0000
ZERO	0.5	–9.587	6.951	8.667	6.907	6.759	1.304	6.692	0.959	0016 or 0017
	20	6.000	11.022	17.202	16.977	11.230	5.417	20.435	5.069	0640
	40	22.000	15.202	25.964	27.314	15.818	9.639	34.542	9.288	1280
	60	38.000	19.381	34.725	37.650	20.407	13.861	48.649	13.507	1920
	80	54.000	23.561	43.487	47.987	24.995	18.083	62.756	17.726	2560
SPAN	100	70.012	27.743	52.255	58.331	29.588	22.308	76.874	21.948	3200 or 3201

Step 10: Set the voltage source to the voltage level for 100 percent of span, as indicated in Table 4-10 for the input card type. Adjust the SPAN potentiometer for channel 1 until the calibrator numerical display fluctuates between 3200 and 3201.

Step 11: Repeat steps 9 and 10 until no adjustment is required for either step.

Step 12: Perform a linearity check for channel 1. Set the voltage supply to the various voltage levels listed Table 4-10 for your card, and observe the calibrator numerical display. Verify that for each voltage level, the display is within ±0004 of the required number listed in the table. If any incorrect numerical display appears, the isolated low-level analog input card requires repair.

Step 13: Repeat steps 7 through 12 for input channels two through four.

Step 14: Remove the external voltage source.

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Disconnect the umbilical cable and remove the isolated low-level analog input card.

4.1.5 Types DM6361 and DM6362 Low-Voltage Discrete Input Cards

Type DM6361 and Type DM6362 Discrete Input Cards use a low-voltage discrete input card. The Type DM6363 Discrete Input Card uses a high-voltage discrete input card. There are no user adjustments on the card. Each card type has a functional test procedure.

4.1.5.1 Overview

The calibrator performs functional testing of the low-voltage discrete input card. During the test, the calibrator checks each of the eight discrete input channels. If any channel fails to perform correctly, replace the discrete input card. Figure 4-6 a low-voltage discrete input card layout diagram.

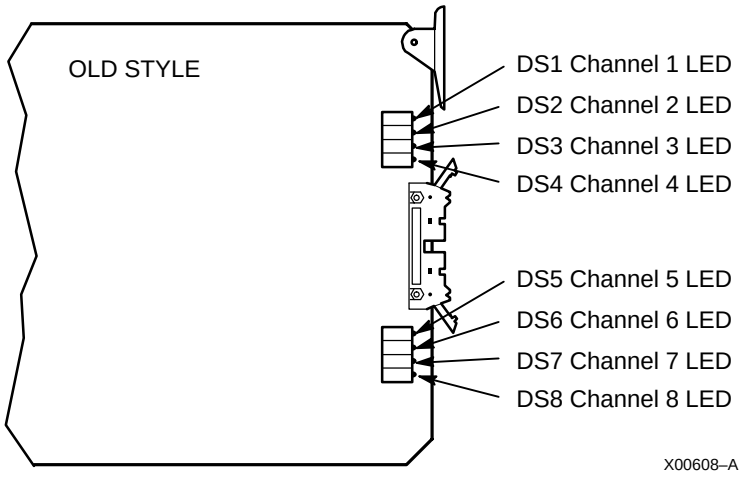


Figure 4-5. Old Style Discrete Input Card

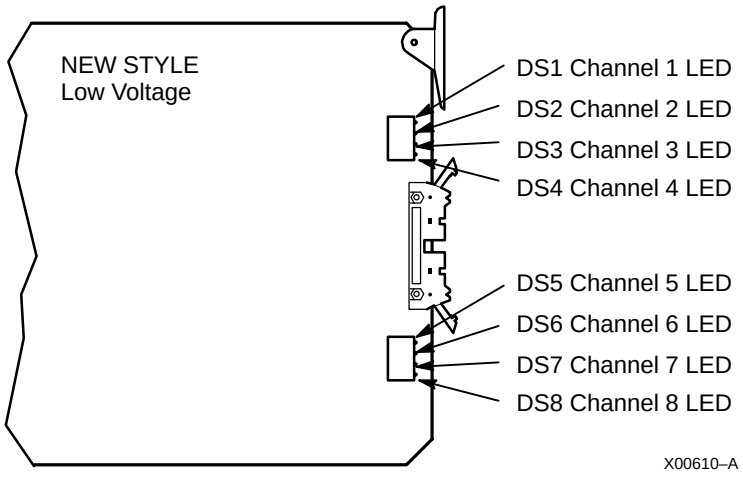


Figure 4-6. Discrete Input Card — Low-voltage

4.1.5.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator

4.1.5.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the discrete input card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the discrete input card and the calibrator receptacle labeled DI.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code** — The card requires repair; terminate procedure and obtain a replacement card
- **0005** — The card is a discrete input card; continue procedure
- **Any Other Code** — The card is not a discrete input card or the card requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator DI group mode switch.

Step 7: Press switch 1 of the calibrator switches labeled MUX DI/DO OR CONTROLLER DI. The DS1 indicator on the discrete input card should light. If the DS1 indicator does not light, or if any other indicators on the card do light, the discrete input card requires repair.

Step 8: Press the MUX DI/DO OR CONTROLLER DI switch 1 again. The DS1 indicator should extinguish. If it does not, the discrete input card requires repair.

Step 9: Repeat steps 7 and 8 for input channels two through eight. Each channel has its own corresponding data switch and indicator.

Step 10: Set the calibrator ON/OFF switch to OFF.

Step 11: Disconnect the umbilical cable and remove the discrete input card.

4.1.6 Types DM6363 High-Voltage Discrete Input Card

4.1.6.1 Overview

The calibrator performs functional testing of the high-voltage discrete input card. During this test, the calibrator checks each of the eight discrete input channels. If any channel fails to perform correctly, replace the discrete input card. Figure 4-7 shows a high-voltage discrete input card layout diagram.

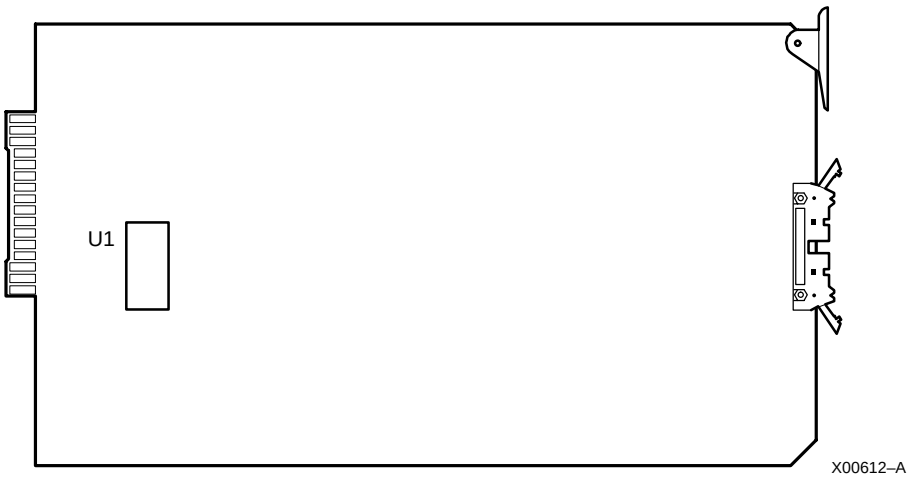


Figure 4-7. Discrete Input Card — High Voltage

4.1.6.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter
- Voltage source
- 400 ohm resistor

4.1.6.3 Calibration Procedures

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the discrete input card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the discrete input card and the calibrator receptacle labeled BREAKOUT CONNECTOR.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code** — The card requires repair; terminate procedure and obtain a replacement card
- **0005** — The card is a discrete input card; continue procedure
- **Any Other Code** — The card is not a discrete input card or the card requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator DI group mode switch.

Step 7: Connect one end of the 400 ohm resistor to the positive breakout terminal for channel 1, listed in Table 4-11.

Table 4-11. Calibrator Breakout Terminal Assignments for High-Voltage Discrete Input Cards

Breakout Terminal	Function
1	Channel 1 +
2	Channel 1 –
3	Channel 2 +
4	Channel 2 –
5	Channel 3 +
6	Channel 3 –
7	Channel 4 +
8	Channel 4 –
9	Channel 5 +
10	Channel 5 –
11	Channel 6 +
12	Channel 6 –
13	Channel 7 +
14	Channel 7 –
15	Channel 8 +
16	Channel 8 –
17	+24 volts
18	+24 volts
19	24 volt return
20	24 volt return

Step 8: With the voltage source turned off, connect the positive lead of the voltage source to the other end of the 400 ohm resistor and the negative lead to the negative breakout terminal for channel 1, listed in Table 4-11.

Step 9: Connect the voltmeter across the voltage source.

Step 10: Turn on the voltage source and adjust the output voltage to 10 volts dc.

Caution

Excessive input voltage under these conditions can cause damage to the input circuits on the card. Never exceed 11 volts dc input during this procedure. The protection normally provided by the termination panel, which allows operation through the full input range of 0 to 150 volts ac, is not present during this test.

The DS1 indicate on the card and the channel 1 indicator on the calibrator labeled MUX DO/DI should both light. If they do not, or if any other indicators do light, the discrete input card requires repair.

Step 11: Adjust the input voltage to 4 volts dc. Both indicators should extinguish. If they do not, the discrete input card requires repair.

Step 12: Repeat steps 7 and 11 for input channels two through eight. Each channel has its own corresponding data switch and indicator. Turn off the voltage source before disconnecting and reconnecting the voltage connections to each channel.

Step 13: Turn the voltage source and the voltmeter OFF. Disconnect them from the breakout terminals.

Step 14: Remove the 400 ohm resistor.

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Disconnect the umbilical cable and remove the discrete input card.

4.1.7 Types DM6371, DM6372, and DM6373 Pulse Count Input Cards

All three type pulse count input cards use the same card. The calibrator performs functional tests of the pulse count input card. There are no user adjustments on the pulse count input cards.

4.1.7.1 Overview

During the functional test, the calibrator checks each of the four pulse count input channels. If any channel fails to perform correctly, replace the pulse count input card. Figure 4-1 shows a pulse count input input card layout diagram.

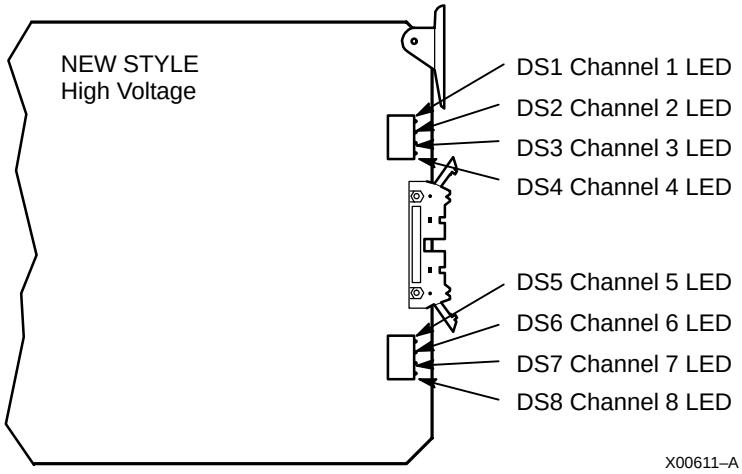


Figure 4-8. Pulse Count Input Card

4.1.7.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Pulse or Waveform Generator

4.1.7.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch to OFF.

Step 2: Insert the pulse count input card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the pulse count input card and the calibrator receptacle labeled BREAKOUT.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code** — The card requires repair; terminate procedure and obtain a replacement card
- **0003** — The card is a pulse count input card; continue procedure
- **Any Other Code** — The card is not a pulse count input card or requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator A12 group mode switch.

Step 7: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 8: Verify that the pulse or waveform signal generator is off. Connect the pulse or waveform generator between the calibrator breakout terminals for channel 1 (see Table 4-12).

Table 4-12. Calibrator Breakout Terminal Assignments for Pulse Count Input Cards

Breakout Terminal	Function
1	Channel 1 +
2	Channel 1 –
3	Channel 2 +
4	Channel 2 –
5	Channel 3 +
6	Channel 3 –
7	Channel 4 +
8	Channel 4 –
9	No connection
10	No connection
11	No connection
12	No connection
13	No connection
14	No connection
15	No connection
16	No connection
17	+24 volts
18	+24 volts
19	24 volt return
20	24 volt return

Step 9: Turn the signal generator on, and if necessary, allow time for the oscillator to stabilize. Set the pulse or waveform generator to approximately 2 Hz. Adjust the output level so the peak output voltage is between 3.5 and 30 volts. If a pulse generator is used, the minimum pulse width is 50 microseconds.

Step 10: Observe the calibrator indicators labeled MUX LS BYTE and the calibrator numerical display. The MUX LS BYTE indicators should blink on and off in a binary counting pattern and the numerical display should increment by one with every pulse. If some or all of the MUX LS BYTE indicators fail to light or if the numerical display fails to count properly then the pulse count input card requires repair.

Step 11: Set the pulse or waveform generator to approximately 7 kilohertz.

Step 12: Observe the calibrator indicators labeled MUX MS BYTE and the calibrator numerical display. The MUX MS BYTE indicators should blink on and off in a binary counting pattern and the calibrator numerical display should increment very rapidly. If some or all of the MUX MS BYTE indicators fail to light or if the numerical display fails to count properly, then the pulse count input card requires repair.

Step 13: Repeat steps 7 through 12 for input channels 2, 3, and 4. Deenergize the signal generator output before disconnecting and reconnecting at the breakout terminals.

Step 14: Turn off and disconnect the pulse or waveform generator.

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Disconnect the umbilical cable and remove the pulse count input card.

4.1.8 Type DM6381 Weigh Scale Interface Card

The weigh scale and the interface card must be less than 1000 feet (304.8 m) apart. For field wiring between the weigh scale and the interface card, use 18 AWG (0.82 mm^2) twisted-pair, shielded cable. Do not route the cable through conduits or trays with other cables used to transmit analog signals.

4.1.8.1 Switch Settings — Type DM6381

The Type DM6381 Weigh Scale Interface uses two switches, S1 and S2, shown in Figure 4-9.

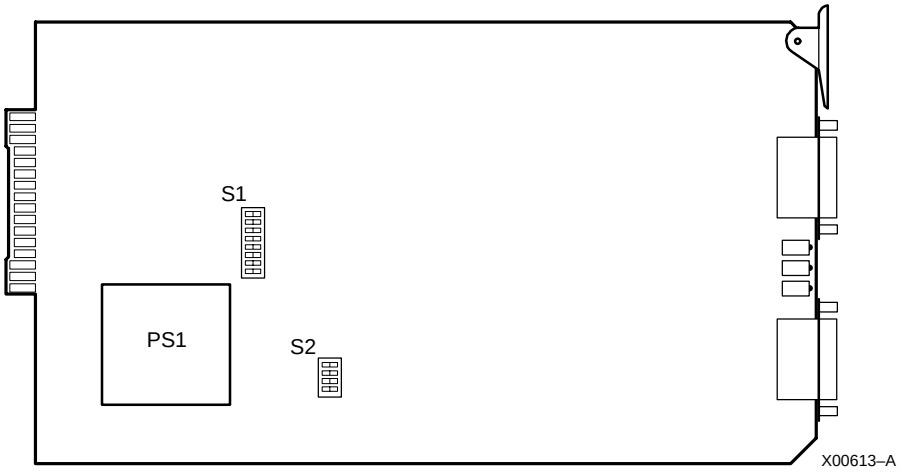


Figure 4-9. Weigh Scale Interface Card

The 8-position DIP switch S1 is the scale capacity switch used to set the scale range. Switch positions 1 through 4 of S1 sets the range for weigh scale number 1 and switch positions 5 through 8 of S1 sets the range for weigh scale number 2. Table 4-13 shows the switch settings for each range.

Table 4-13. Weigh Scale Interface Card Range Switch Settings

	For Weigh Scale No. 1				For Weigh Scale No. 2			
	S1 Switch Position				S1 Switch Position			
Scale Range	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Not used	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0-50	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
0-100	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
0-300	ON	ON	OFF	OFF	ON	ON	OFF	OFF
0-500	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
0-1000	ON	OFF	ON	OFF	ON	OFF	ON	OFF
0-2000	OFF	ON	ON	OFF	OFF	ON	ON	OFF
0-3000	ON	ON	ON	OFF	ON	ON	ON	OFF
0-5000	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
0-10000	ON	OFF	OFF	ON	ON	OFF	OFF	ON
0-20000	OFF	ON	OFF	ON	OFF	ON	OFF	ON
0-30000	ON	ON	OFF	ON	ON	ON	OFF	ON
0-50000	OFF	OFF	ON	ON	OFF	OFF	ON	ON
0-100000	ON	OFF	ON	ON	ON	OFF	ON	ON
0-200000	OFF	ON	ON	ON	OFF	ON	ON	ON
Not used	ON	ON	ON	ON	ON	ON	ON	ON

The 4-position DIP switch S2 is the scale type select switch used to indicate the type of weigh scale being used. Table 4-14 shows the switch setting for each scale type.

Table 4-14. Weigh Scale Interface Card Scale Type Select Switch Settings

Scale Type	Switch Position on S2			
	1	2	3	4
Toledo(1) and BLH LCp-10(2)	OFF	OFF	ON	OFF
Masstron M5000	OFF	OFF	ON	ON
BLH 4310A and 4315A	OFF	OFF	OFF	ON
Special WSI	OFF	OFF	OFF	OFF

1. These switch settings apply to Toledo models 8132, 8140, and 8142.
2. The BLH LCp-10 requires a custom EPROM from BLH to interface to the PROVOX system. It uses the Toledo protocol and the Toledo switch settings.

In addition to the switches on the weigh scale interface card, you must also correctly set certain switches on Toledo and BLH weigh scales to permit correct system interface. Table 4-15 and Table 4-16 provide these settings. Masstron weigh scales use jumpers, indicated in Table 4-17, to indicate the correct configuration.

Table 4-15. Switch Settings on Toledo Weigh Scale Model 8132

Switch	Position	Setting(1)	Explanation
SW5	4	OFF	Tare display on
SW6	5	ON	Demand mode normal (continuous)
	6	OFF	Normal mode expand (cal only)
SW7	2	OFF	Checksum required
	6	ON	Baud rate select
	7	ON	4800 baud(2)

1. Switches and positions not listed in this table do not affect weigh scale interface operation.
2. Revised 8132 scales use SW7-6 and SW7-7 to select the baud rate and format. In older versions only SW7-6 must be ON.

Toledo Weigh Scale models 8140, 8142, and all newer models use a programming menu for configuration. Refer to the documentation for the model scale you are configuring. For either of these scales use the continuous output mode at 4800 baud with a checksum character.

Table 4-16. Switch Settings on BLH Weigh Scale Models 4310A and 4315A(1)

Switch(2)	Position	Setting	Description
SW1	1	OFF	2 stop bits
	2	OFF	Even parity
	3	OFF	9600 baud
	4	ON	—
	5	ON	—
	6	ON	—
	7	ON	20 mA comms mode
	8	OFF	—
SW2	1	ON	Xmit on demand
	2	OFF	Xmit on motion and overload conditions
	3	OFF	—
	4	OFF	—

1. Switches and positions not listed in this table do not affect weigh scale interface operation.
2. Switches are located on the BLH scale option 10 board and not the main board.

The data format for the BLH scales is 11 bit ASCII, 1 start bit, 7 data bits, even parity, and 2 stop bits at 9600 baud.

Note

The BLH LCp-10 requires a custom EPROM from BLH to interface to the weigh scale interface card. The custom LCp-10 uses the same protocol as the Teledo scale. This requires the weigh scale interface card to be set for the Teledo mode.

Table 4-17. Masstron Model M5000 Jumper Position(1)

Jumper	Description	Required Position	Explanation
JU3	Baud Rate	1 (top)	4800 baud
JU7	Comp Xmit	ON	Active
JU8	Comp Xmit	ON	Active
JU13 (old style)	Clear to Send	OFF (open)	Disabled
JU13 (new style)	20mA/RS-232	20 mA	20 mA

1. Jumpers not included in this table do not apply to interface card use.

The data format for the Masstron Model M5000 is 10 bit ASCII, 1 start bit, 8 data bits, no parity, and 1 stop bit at 4800 baud.

The M5000 operates in one of two modes: Setup/Calibration or Weight. Select the mode with SW1-1. Set this switch to OFF (open) during normal operation.

4.1.8.2 Overview

The calibrator performs functional tests of the weigh scale interface card. There are no user adjustments on the weigh scale interface cards.

During the functional test, the calibrator provides power and allows the weigh scale interface card to perform self-tests. If any test fails to perform correctly, replace the weigh scale interface card.

4.1.8.3 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator

4.1.8.4 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch to OFF.

Step 2: Insert the weigh scale interface card in the calibrator test slot labeled MUX.

Step 3: Turn the calibrator ON. Observe the one green and two yellow LED indicators on the front edge of the card. The following sequence should occur:

a. **Yellow LED's Light** — The card executes power-up self-tests

b. **Yellow LED's Extinguish and Green LED Lights** — Self-tests complete satisfactorily and card is functioning correctly

If a yellow LED blinks at about every 2.4 seconds, switch S2 is set to an undefined scale type. Reset the switch to a defined scale type, as listed in Table 4-18 and perform the test again.

If a yellow LED blinks at about every 1.5 seconds or no LED's light, the weigh scale interface card requires repair.

Table 4-18. Weigh Scale Interface Card Scale Type Select Switch Settings

Scale Type	Switch Position on S2			
	1	2	3	4
Toledo	OFF	OFF	ON	OFF
Masstron	OFF	OFF	ON	ON
BLH	OFF	OFF	OFF	ON
Special WSI	OFF	OFF	OFF	OFF

Step 4: Set the calibrator ON/OFF switch to OFF.

Step 5: Remove the weigh scale interface card.

4.2 Type DM6400-Series — Output Cards

The following subsections give the installation information for DM6400-Series output cards.

4.2.1 Type DM6411 Analog Voltage and DM6421 Analog Current Output Cards

The Type DM6411 Analog Voltage Output Card and the Type DM6421 Analog Current Output Card use different versions of the same card.

4.2.1.1 Overview

For both versions, calibration consists of setting a minimum and maximum voltage output level for each of the four output channels and testing linearity. The ZERO potentiometer controls the minimum level. The 0 percent level is set at 1 volt. The SPAN potentiometer controls the maximum level. The procedure for both card versions is identical except that analog voltage outputs are measured across the calibrator breakout terminals, while analog current outputs are jumpered to the calibrator 250 OHM LOAD terminals and measured across the load. Figure 4-10 shows the location of the ZERO and SPAN potentiometers for each channel on an analog output card.

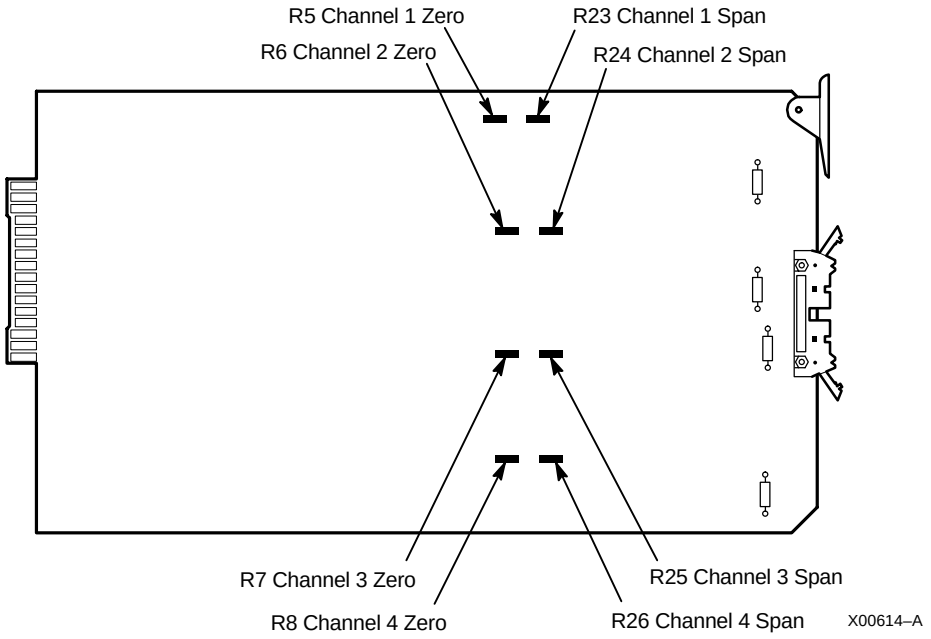


Figure 4-10. Analog Voltage and Type DM6421 Analog Current Output Card

4.2.1.2 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

4.2.1.3 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is set to OFF.

Step 2: Insert the analog output card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DI/BREAKOUT between the connector on the front of the analog output card and the calibrator receptacle labeled BREAK-OUT CONNECTOR.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display should show the card identification code 0002. If no card identification code appears, the analog output card requires repair. If another card identification code appears, the card is not an analog output card or the analog output card requires repair.

Step 6: Press the calibrator AO group mode switch.

Step 7: Set the calibrator CHANNEL SELECT switch to channel 1.

Step 8: If the card is a voltage output version, connect the voltmeter between the calibrator breakout terminals listed in Table 4-19 for channel 1. If the card is a current output card, connect the voltmeter across the calibrator 250 OHM LOAD terminals and jumper the calibrator breakout terminals for channel 1 to the calibrator 250 OHM LOAD terminals.

Table 4-19. Calibrator Breakout Terminal Assignments for Analog Outputs Cards

Breakout Terminal	Function
1	Channel 1 Output
2	Common Return
3	Channel 2 Output
4	Common Return
5	Channel 3 Output
6	Common Return
7	Channel 4 Output
8	Common Return
9	No connection
10	No connection
11	No connection
12	No connection
13	No connection
14	No connection
15	No connection
16	No connection
17	+24 volts
18	+24 volts
19	24 volt return
20	24 volt return

Note

Verify analog output card type before calibration. The voltage output card cannot drive a 250 ohm load. A current output card will produce very high readings if it is not loaded.

Step 9: Set the calibrator data switches 10 through 1 (labeled MUX DATA BYTE 1 and MUX DATA BYTE 2) for zero percent of span as shown in Table 4-20. Adjust the ZERO potentiometer for channel 1 until the voltmeter reads 1.000 ±0.005 volts dc.

Table 4-20. Data Switch Settings for Analog Output Cards

Adjustment	% Span	Output		Data Switches(1)										Numerical Display
		Volts	Milliamperes	10	9	8	7	6	5	4	3	2	1	
	–25	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0000
ZERO(2)	0	1.0	4.0	0	0	1	1	0	0	1	0	0	0	0200
	20	1.8	7.2	0	1	0	1	1	0	1	0	0	0	0360
	40	2.6	10.4	1	0	0	0	0	0	1	0	0	0	0520
	60	3.4	13.6	1	0	1	0	1	0	1	0	0	0	0680
	80	4.2	16.8	1	1	0	1	0	0	1	0	0	0	0840
SPAN(3)	100	5.0	20.0	1	1	1	1	1	0	1	0	0	0	1000

1. 0=OFF; 1=ON
2. ZERO adjustments use R5 for channel 1, R6 for channel 2, R7 for channel 3, and R8 for channel 4
3. SPAN adjustments use R23 for channel 1, R24 for channel 2, R25 for channel 3, and R26 for channel 4

Step 10: Set the calibrator data switches 10 through 1 for 100 percent of span as shown in Table 4-20. Adjust the SPAN potentiometer for channel 1 until the voltmeter reads 5.000 ±0.005 volts dc.

Step 11: Repeat steps 9 and 10 until no adjustment is required for either step.

Step 12: Perform a linearity check for channel 1. Set the calibrator data switches to the various percentages of span listed Table 4-20, and observe the voltmeter. Verify that for each data value, the meter shows the expected voltage level within ±.008 volts dc. If any incorrect voltage appears, the analog output card requires repair.

Step 13: Repeat steps 7 through 12 for analog output channels two through four.

Step 14: Disconnect the voltmeter.

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Disconnect the umbilical cable and remove the analog output card.

4.2.2 DM6460-Series Discrete Output Cards

All DM6460-Series Discrete Output Cards use the same card. The card is available with one of two options: latched and momentary.

4.2.2.1 Switch Settings — DM6460-Series

For momentary output only, the card uses eight 8-position DIP switches, one for each output channel, to set the duration of the channel output. Each channel can be set independently, from 0.1 to 25.5 seconds, variable in 0.1 second increments, which is the time that the output is ON. Set the time for each channel by moving the appropriate switches to ON. Figure 4-11 shows the location of the switches on the card. Table 4-21 lists the correct switch settings for each selectable time interval. The time value for each switch position is printed on the card next to the switch. The output time is equal to the sum of the values of the switches moved to the ON position.

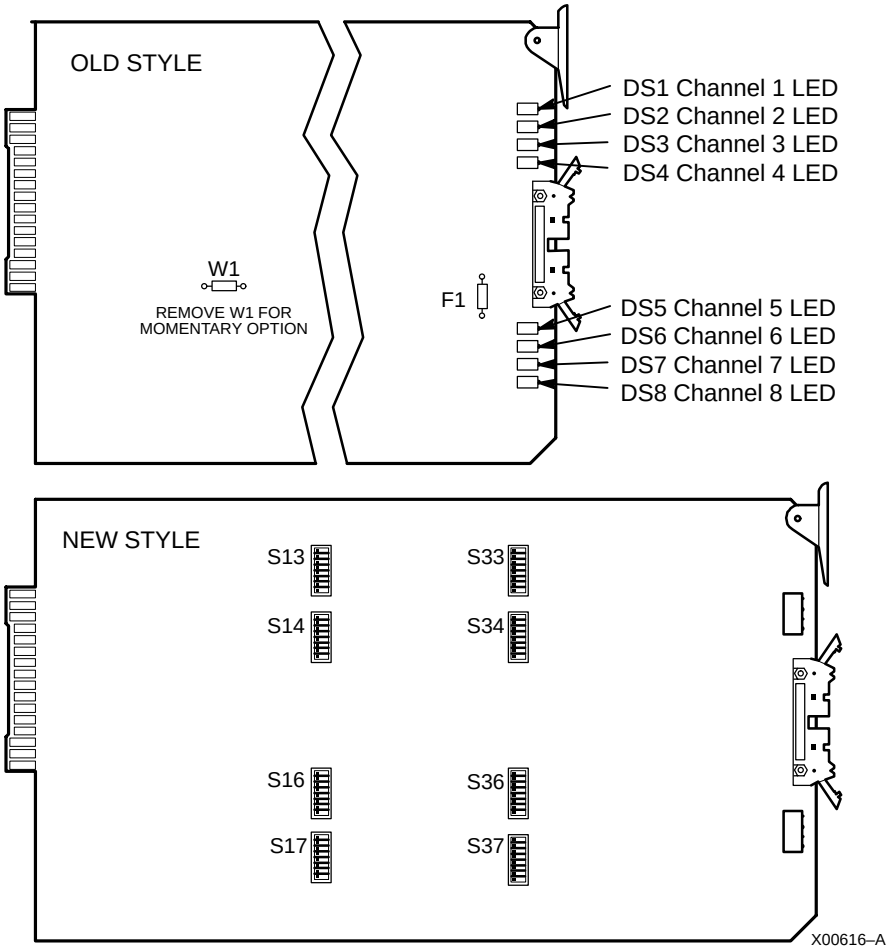


Figure 4-11. Discrete Output Card with Momentary Output Switches

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
0.1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
0.2	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
0.3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
0.4	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
0.5	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
0.6	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
0.7	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
0.8	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
0.9	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
1.0	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
1.1	OFF	OFF	OFF	OFF	ON	OFF	ON	ON
1.2	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
1.3	OFF	OFF	OFF	OFF	ON	ON	OFF	ON
1.4	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
1.5	OFF	OFF	OFF	OFF	ON	ON	ON	ON
1.6	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
1.7	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
1.8	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
1.9	OFF	OFF	OFF	ON	OFF	OFF	ON	ON
2.0	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
2.1	OFF	OFF	OFF	ON	OFF	ON	OFF	ON
2.2	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
2.3	OFF	OFF	OFF	ON	OFF	ON	ON	ON
2.4	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
2.5	OFF	OFF	OFF	ON	ON	OFF	OFF	ON
2.6	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
2.7	OFF	OFF	OFF	ON	ON	OFF	ON	ON
2.8	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
2.9	OFF	OFF	OFF	ON	ON	ON	OFF	ON
3.0	OFF	OFF	OFF	ON	ON	ON	ON	OFF
3.1	OFF	OFF	OFF	ON	ON	ON	ON	ON
3.2	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
3.3	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
3.4	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
3.5	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
3.6	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
3.7	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
3.8	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
3.9	OFF	OFF	ON	OFF	OFF	ON	ON	ON
4.0	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
4.1	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
4.2	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
4.3	OFF	OFF	ON	OFF	ON	OFF	ON	ON
4.4	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
4.5	OFF	OFF	ON	OFF	ON	ON	OFF	ON
4.6	OFF	OFF	ON	OFF	ON	ON	ON	OFF
4.7	OFF	OFF	ON	OFF	ON	ON	ON	ON
4.8	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
4.9	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
5.0	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
5.1	OFF	OFF	ON	ON	OFF	OFF	ON	ON
5.2	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
5.3	OFF	OFF	ON	ON	OFF	ON	OFF	ON
5.4	OFF	OFF	ON	ON	OFF	ON	ON	OFF
5.5	OFF	OFF	ON	ON	OFF	ON	ON	ON
5.6	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
5.7	OFF	OFF	ON	ON	ON	OFF	OFF	ON
5.8	OFF	OFF	ON	ON	ON	OFF	ON	OFF
5.9	OFF	OFF	ON	ON	ON	OFF	ON	ON
6.0	OFF	OFF	ON	ON	ON	ON	OFF	OFF
6.1	OFF	OFF	ON	ON	ON	ON	OFF	ON
6.2	OFF	OFF	ON	ON	ON	ON	ON	OFF
6.3	OFF	OFF	ON	ON	ON	ON	ON	ON
6.4	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
6.5	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
6.6	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
6.7	OFF	ON	OFF	OFF	OFF	OFF	ON	ON
6.8	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
6.9	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
7.0	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
7.1	OFF	ON	OFF	OFF	OFF	ON	ON	ON
7.2	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
7.3	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
7.4	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
7.5	OFF	ON	OFF	OFF	ON	OFF	ON	ON
7.6	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
7.7	OFF	ON	OFF	OFF	ON	ON	OFF	ON
7.8	OFF	ON	OFF	OFF	ON	ON	ON	OFF
7.9	OFF	ON	OFF	OFF	ON	ON	ON	ON
8.0	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
8.1	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
8.2	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
8.3	OFF	ON	OFF	ON	OFF	OFF	ON	ON
8.4	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
8.5	OFF	ON	OFF	ON	OFF	ON	OFF	ON
8.6	OFF	ON	OFF	ON	OFF	ON	ON	OFF
8.7	OFF	ON	OFF	ON	OFF	ON	ON	ON
8.8	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
8.9	OFF	ON	OFF	ON	ON	OFF	OFF	ON
9.0	OFF	ON	OFF	ON	ON	OFF	ON	OFF
9.1	OFF	ON	OFF	ON	ON	OFF	ON	ON
9.2	OFF	ON	OFF	ON	ON	ON	OFF	OFF
9.3	OFF	ON	OFF	ON	ON	ON	OFF	ON
9.4	OFF	ON	OFF	ON	ON	ON	ON	OFF
9.5	OFF	ON	OFF	ON	ON	ON	ON	ON
9.6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
9.7	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
9.8	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
9.9	OFF	ON	ON	OFF	OFF	OFF	ON	ON
10.0	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
10.1	OFF	ON	ON	OFF	OFF	ON	OFF	ON
10.2	OFF	ON	ON	OFF	OFF	ON	ON	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
10.3	OFF	ON	ON	OFF	OFF	ON	ON	ON
10.4	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
10.5	OFF	ON	ON	OFF	ON	OFF	OFF	ON
10.6	OFF	ON	ON	OFF	ON	OFF	ON	OFF
10.7	OFF	ON	ON	OFF	ON	OFF	ON	ON
10.8	OFF	ON	ON	OFF	ON	ON	OFF	OFF
10.9	OFF	ON	ON	OFF	ON	ON	OFF	ON
11.0	OFF	ON	ON	OFF	ON	ON	ON	OFF
11.1	OFF	ON	ON	OFF	ON	ON	ON	ON
11.2	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
11.3	OFF	ON	ON	ON	OFF	OFF	OFF	ON
11.4	OFF	ON	ON	ON	OFF	OFF	ON	OFF
11.5	OFF	ON	ON	ON	OFF	OFF	ON	ON
11.6	OFF	ON	ON	ON	OFF	ON	OFF	OFF
11.7	OFF	ON	ON	ON	OFF	ON	OFF	ON
11.8	OFF	ON	ON	ON	OFF	ON	ON	OFF
11.9	OFF	ON	ON	ON	OFF	ON	ON	ON
12.0	OFF	ON	ON	ON	ON	OFF	OFF	OFF
12.1	OFF	ON	ON	ON	ON	OFF	OFF	ON
12.2	OFF	ON	ON	ON	ON	OFF	ON	OFF
12.3	OFF	ON	ON	ON	ON	OFF	ON	ON
12.4	OFF	ON	ON	ON	ON	ON	OFF	OFF
12.5	OFF	ON	ON	ON	ON	ON	OFF	ON
12.6	OFF	ON	ON	ON	ON	ON	ON	OFF
12.7	OFF	ON	ON	ON	ON	ON	ON	ON
12.8	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
12.9	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
13.0	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
13.1	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
13.2	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF
13.3	ON	OFF	OFF	OFF	OFF	ON	OFF	ON
13.4	ON	OFF	OFF	OFF	OFF	ON	ON	OFF
13.5	ON	OFF	OFF	OFF	OFF	ON	ON	ON
13.6	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
13.7	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
13.8	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
13.9	ON	OFF	OFF	OFF	ON	OFF	ON	ON
14.0	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
14.1	ON	OFF	OFF	OFF	ON	ON	OFF	ON
14.2	ON	OFF	OFF	OFF	ON	ON	ON	OFF
14.3	ON	OFF	OFF	OFF	ON	ON	ON	ON
14.4	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
14.5	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
14.6	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
14.7	ON	OFF	OFF	ON	OFF	OFF	ON	ON
14.8	ON	OFF	OFF	ON	OFF	ON	OFF	OFF
14.9	ON	OFF	OFF	ON	OFF	ON	OFF	ON
15.0	ON	OFF	OFF	ON	OFF	ON	ON	OFF
15.1	ON	OFF	OFF	ON	OFF	ON	ON	ON
15.2	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
15.3	ON	OFF	OFF	ON	ON	OFF	OFF	ON
15.4	ON	OFF	OFF	ON	ON	OFF	ON	OFF
15.5	ON	OFF	OFF	ON	ON	OFF	ON	ON
15.6	ON	OFF	OFF	ON	ON	ON	OFF	OFF
15.7	ON	OFF	OFF	ON	ON	ON	OFF	ON
15.8	ON	OFF	OFF	ON	ON	ON	ON	OFF
15.9	ON	OFF	OFF	ON	ON	ON	ON	ON
16.0	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
16.1	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
16.2	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
16.3	ON	OFF	ON	OFF	OFF	OFF	ON	ON
16.4	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
16.5	ON	OFF	ON	OFF	OFF	ON	OFF	ON
16.6	ON	OFF	ON	OFF	OFF	ON	ON	OFF
16.7	ON	OFF	ON	OFF	OFF	ON	ON	ON
16.8	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
16.9	ON	OFF	ON	OFF	ON	OFF	OFF	ON
17.0	ON	OFF	ON	OFF	ON	OFF	ON	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
17.1	ON	OFF	ON	OFF	ON	OFF	ON	ON
17.2	ON	OFF	ON	OFF	ON	ON	OFF	OFF
17.3	ON	OFF	ON	OFF	ON	ON	OFF	ON
17.4	ON	OFF	ON	OFF	ON	ON	ON	OFF
17.5	ON	OFF	ON	OFF	ON	ON	ON	ON
17.6	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
17.7	ON	OFF	ON	ON	OFF	OFF	OFF	ON
17.8	ON	OFF	ON	ON	OFF	OFF	ON	OFF
17.9	ON	OFF	ON	ON	OFF	OFF	ON	ON
18.0	ON	OFF	ON	ON	OFF	ON	OFF	OFF
18.1	ON	OFF	ON	ON	OFF	ON	OFF	ON
18.2	ON	OFF	ON	ON	OFF	ON	ON	OFF
18.3	ON	OFF	ON	ON	OFF	ON	ON	ON
18.4	ON	OFF	ON	ON	ON	OFF	OFF	OFF
18.5	ON	OFF	ON	ON	ON	OFF	OFF	ON
18.6	ON	OFF	ON	ON	ON	OFF	ON	OFF
18.7	ON	OFF	ON	ON	ON	OFF	ON	ON
18.8	ON	OFF	ON	ON	ON	ON	OFF	OFF
18.9	ON	OFF	ON	ON	ON	ON	OFF	ON
19.0	ON	OFF	ON	ON	ON	ON	ON	OFF
19.1	ON	OFF	ON	ON	ON	ON	ON	ON
19.2	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
19.3	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
19.4	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
19.5	ON	ON	OFF	OFF	OFF	OFF	ON	ON
19.6	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
19.7	ON	ON	OFF	OFF	OFF	ON	OFF	ON
19.8	ON	ON	OFF	OFF	OFF	ON	ON	OFF
19.9	ON	ON	OFF	OFF	OFF	ON	ON	ON
20.0	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
20.1	ON	ON	OFF	OFF	ON	OFF	OFF	ON
20.2	ON	ON	OFF	OFF	ON	OFF	ON	OFF
20.3	ON	ON	OFF	OFF	ON	OFF	ON	ON
20.4	ON	ON	OFF	OFF	ON	ON	OFF	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
20.5	ON	ON	OFF	OFF	ON	ON	OFF	ON
20.6	ON	ON	OFF	OFF	ON	ON	ON	OFF
20.7	ON	ON	OFF	OFF	ON	ON	ON	ON
20.8	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
20.9	ON	ON	OFF	ON	OFF	OFF	OFF	ON
21.0	ON	ON	OFF	ON	OFF	OFF	ON	OFF
21.1	ON	ON	OFF	ON	OFF	OFF	ON	ON
21.2	ON	ON	OFF	ON	OFF	ON	OFF	OFF
21.3	ON	ON	OFF	ON	OFF	ON	OFF	ON
21.4	ON	ON	OFF	ON	OFF	ON	ON	OFF
21.5	ON	ON	OFF	ON	OFF	ON	ON	ON
21.6	ON	ON	OFF	ON	ON	OFF	OFF	OFF
21.7	ON	ON	OFF	ON	ON	OFF	OFF	ON
21.8	ON	ON	OFF	ON	ON	OFF	ON	OFF
21.9	ON	ON	OFF	ON	ON	OFF	ON	ON
22.0	ON	ON	OFF	ON	ON	ON	OFF	OFF
22.1	ON	ON	OFF	ON	ON	ON	OFF	ON
22.2	ON	ON	OFF	ON	ON	ON	ON	OFF
22.3	ON	ON	OFF	ON	ON	ON	ON	ON
22.4	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
22.5	ON	ON	ON	OFF	OFF	OFF	OFF	ON
22.6	ON	ON	ON	OFF	OFF	OFF	ON	OFF
22.7	ON	ON	ON	OFF	OFF	OFF	ON	ON
22.8	ON	ON	ON	OFF	OFF	ON	OFF	OFF
22.9	ON	ON	ON	OFF	OFF	ON	OFF	ON
23.0	ON	ON	ON	OFF	OFF	ON	ON	OFF
23.1	ON	ON	ON	OFF	OFF	ON	ON	ON
23.2	ON	ON	ON	OFF	ON	OFF	OFF	OFF
23.3	ON	ON	ON	OFF	ON	OFF	OFF	ON
23.4	ON	ON	ON	OFF	ON	OFF	ON	OFF
23.5	ON	ON	ON	OFF	ON	OFF	ON	ON
23.6	ON	ON	ON	OFF	ON	ON	OFF	OFF
23.7	ON	ON	ON	OFF	ON	ON	OFF	ON
23.8	ON	ON	ON	OFF	ON	ON	ON	OFF

Table 4-21. Momentary Output Duration Switch Settings for DM6460-Series Discrete Output Cards (Continued)

Required Output Durations in Seconds	Switch Positions for S13, S14, S16, S17, S33, S34, S36, and S37							
	1	2	3	4	5	6	7	8
23.9	ON	ON	ON	OFF	ON	ON	ON	ON
24.0	ON	ON	ON	ON	OFF	OFF	OFF	OFF
24.1	ON	ON	ON	ON	OFF	OFF	OFF	ON
24.2	ON	ON	ON	ON	OFF	OFF	ON	OFF
24.3	ON	ON	ON	ON	OFF	OFF	ON	ON
24.4	ON	ON	ON	ON	OFF	ON	OFF	OFF
24.5	ON	ON	ON	ON	OFF	ON	OFF	ON
24.6	ON	ON	ON	ON	OFF	ON	ON	OFF
24.7	ON	ON	ON	ON	OFF	ON	ON	ON
24.8	ON	ON	ON	ON	ON	OFF	OFF	OFF
24.9	ON	ON	ON	ON	ON	OFF	OFF	ON
25.0	ON	ON	ON	ON	ON	OFF	ON	OFF
25.1	ON	ON	ON	ON	ON	OFF	ON	ON
25.2	ON	ON	ON	ON	ON	ON	OFF	OFF
25.3	ON	ON	ON	ON	ON	ON	OFF	ON
25.4	ON	ON	ON	ON	ON	ON	ON	OFF
25.5	ON	ON	ON	ON	ON	ON	ON	ON

4.2.3 Types DM6461, DM6462, and DM6463 Discrete Output Cards

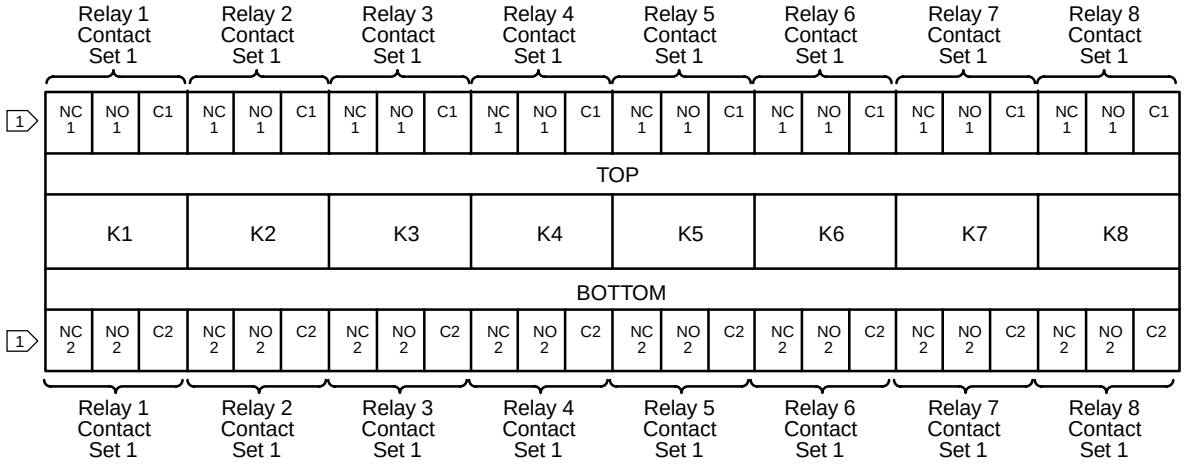
The field wiring from the Type DM6462 and Type DM6463 Discrete Output Cards requires special consideration because these wires typically carry high voltages (115 to 240 volts ac) or high switched currents (up to 10 amperes). For this reason, consider these wires as ac power lines, and maintain physical separation between field wiring for these cards and the other I/O cards. For long runs, bring field wiring to a junction box and then route through multipair shielded cable.

4.2.3.1 Discrete Output to External Field Device Connections

The field wiring information for these boards is located in the planning manual: *Installing Type CP6601 Input/Output File* (PN4.4:CP6601).

4.2.3.2 External Relay Panel

Field wiring for the Type DM6463 Discrete Output Card connects to the barrier strip field wiring terminals on the external relay panel, shown in Figure 4-12.



Notes:

1 NC = Normally Closed, NO = Normally Open, C = Common, (Normally indicates dednergized state)

X00588:CP6601–0

Figure 4-12. External Relay Panel Barrier Strip and Field Wiring Terminals

4.2.3.3 Switch Settings

See subsection 4.2.2.1 for the DM6460-Series card switch settings.

4.2.3.4 Overview

The calibrator performs functional tests of the discrete output cards. These tests simultaneously check all eight outputs on the discrete output card. Although all three discrete output card types use the same card, the card is available in two versions: momentary and latching.

The field wiring information for these boards is located in the planning manual: *Installing Type CP6601 Input/Output File* (PN4.4:CP6601).

4.2.3.5 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator

4.2.3.6 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the discrete output card in the calibrator test slot labeled MUX.

Step 3: Connect the umbilical cable labeled MUX DO between the connector on the end of the discrete output card and the calibrator receptacle labeled DO.

Step 4: Turn the calibrator ON.

Step 5: Press the calibrator MUX switch. The calibrator numerical display shows one of the following:

- **No Code —** The card requires repair; terminate procedure and obtain a replacement card
- **0004** — The card is a momentary output version (part number 46A3672X022—old style); continue procedure
- 0006 — The card is a latching output version (part number 46A3672X012—old style); continue procedure
- **0132** — The card is a momentary output version (part number 39A1173X—with switches S1 to S8—new style) with user adjustable closure time, before exercising output; continue procedure
- **0134** — The card is a latching output version (part number 39A1173X—without switches S1 to S8—new style) before exercising any output; continue procedure
- **0196** — The card is a momentary output version (part number 39A1173X—with switches S1 to S8—new style) with user adjustable closure time, after exercising output; continue procedure
- **0198** — The card is a latching output version (part number 39A1173X—without switches S1 to S8—new style) after exercising any output; continue procedure
- **Any Other Code** — The card is not a discrete output card, or requires repair; terminate procedure and obtain a replacement card

Step 6: Press the calibrator DO group mode switch.

Step 7: Press switches 1, 3, 5, and 7 of the calibrator switches labeled MUX DO/DI OR CONTROLLER DI.

Step 8: Press the calibrator CHK MOM switch. On the discrete output card, the red indicators labeled DS1, DS3, DS5, and DS7 should light. On the calibrator, MUX DO/DI indicators 1, 3, 5, and 7 should light. If any of the indicators listed fail to light, or if any of the other indicators on the discrete output card or calibrator light, then the discrete output card requires repair.

Note

For cards with momentary output, hold down the CHK MOM switch long enough to ensure card has time to respond. If the card has switches S1 through S8, closure times are user- adjustable. For these cards the indicators on the card and the MUX DO/DI indicators on the calibrator stay on for 0.1 to 25.5 seconds, as determined by the individual channel switch settings. The closure time is equal to the sum of the activated switch times. Individual switch times are silkscreened on the card next to the switch positions.

Step 9: Press each of the eight calibrator switches labeled MUX DO/DI OR CONTROLLER DI so the indicators on switches 1, 3, 5, and 7 go out and the indicators on switches 2, 4, 6, and 8 light.

Step 10: Press the calibrator CHK MOM switch. On the discrete output card, indicators DS2, DS4, DS6, and DS8 should light. On the calibrator, MUX DO/DI indicators 2, 4, 6, and 8 should light. Discrete output card indicators DS1, 3, 5, and 7, and MUX DO/DI indicators 1, 3, 5, and 7 should go out. If any of the indicators listed fail to light, or if any of the other indicators on the discrete output card or calibrator remain lit, then the discrete output card requires repair.

Note

For cards with momentary output, hold down the CHK MOM switch long enough to ensure card has time to respond. If the card has switches S1 through S8, closure times are user-adjustable. For these cards the indicators on the card and the MUX DO/DI indicators on the calibrator stay on for 0.1 to 25.5 seconds, as determined by the individual channel switch settings. The closure time is equal to the sum of the activated switch times. Individual switch times are silkscreened on the card next to the switch positions.

Step 11: Press MUX DO/DI OR CONTROLLER DI switches 2, 4, 6, and 8 again to switch them off.

Step 12: Press the calibrator CHK MOM switch. All the indicators on the discrete output card should remain unlit. If any of the indicators on the discrete output card are lit, the discrete output card requires repair.

Note

For cards with momentary output, hold down the CHK MOM switch long enough to ensure card has time to respond. If the card has switches S1 through S8, closure times are user-adjustable. For these cards the indicators on the card and the MUX DO/DI indicators on the calibrator stay on for 0.1 to 25.5 seconds, as determined by the individual channel switch settings. The closure time is equal to the sum of the activated switch times. Individual switch times are silkscreened on the card next to the switch positions.

Step 13: Set the calibrator ON/OFF switch to OFF.

Step 14: Disconnect the umbilical cable and remove the discrete output card.

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5 Controller Cards

This section contains the calibration procedures for:

- Type CL6003 Interactive Controller
- Type CL6011 Interactive Controller Card
- MPU and Discrete I/O Cards
- Type CL6201 Configurable Controller Card
- Type CL6202 Computing Controller Card
- Type CL7011 Computing Controller Card (without Dual Current Output)
- Type CL7011 Computing Controller Card (with Dual Current Output)
- Type CL7311/CL7312 Redundant Manual Control Cards
- Type CN6201 Indicator Card
- Type CP7202 Controller Power Conversion Card
- Type CS6201 Service Transfer Card
- Type DH7010 Power Converter Card

5.1 Type CL6003 Interactive Controller

The calibration procedure for the Interactive Controller consists of two separate procedures. The Interactive Controller is not calibrated as a single unit. The microprocessor (MPU) card and discrete I/O (if present) are tested together. This is a functional test; there are no user adjustments on these cards. Only one process I/O card may be calibrated at a time. The calibration procedure for the process I/O card allows the user to adjust the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuit. It also allows the measurement of the 0 percent and 100 percent values of the analog current outputs and the adjustment of the 100 percent values of the analog current outputs.

5.1.1 MPU Card

Use the following procedure to calibrate the MPU card.

5.1.1.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.1.1.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the MPU card shown in Figure 5-1, in the test slot labeled MPU. If a discrete I/O card shown in Figure 5-2, is present, insert it in the test slot labeled DIO. Ensure that the switch on the front of the MPU card is in the UP position.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator should light and remain lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light within one minute, the MPU and discrete I/O cards require repair.

Step 5: Press the CAL LOW switch.

Note

The SCAN ERROR indicator may be lit while the calibrator is in the CAL LOW mode. This is a normal condition.

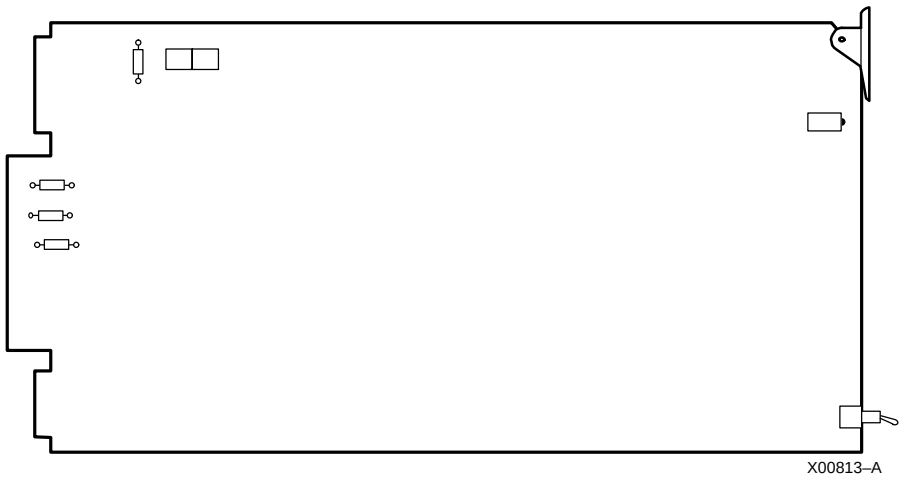

Figure 5-1. Type CL6003 Interactive Controller MPU Unit

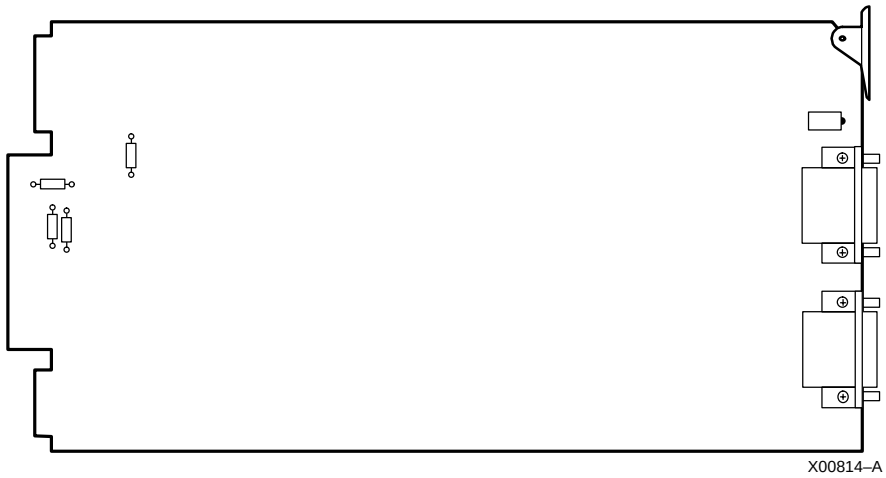

Figure 5-2. Type CL6003 Interactive Controller Discrete I/O Card

Step 6: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 thru 4 light up sequentially and then repeat the sequence. If a discrete I/O card is also being tested, CONTROLLER DO indicators 5 thru 8 are also part of the sequence. If some or all of the CONTROLLER DO indicators fail to light or light in an incorrect sequence, the MPU card or discrete I/O card requires repair.

Step 7: Press the CAL HIGH switch.

Note

The SCAN ERROR indicator may be lit while the calibrator is in the CAL HIGH mode. This is a normal condition.

Step 8: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 thru 4 blink on and off as the discrete outputs are subjected to a binary counting test. If a discrete I/O card is also being tested, CONTROLLER DO indicators 5 thru 8 are included in the binary counting test. If some or all of the CONTROLLER DO indicators fail to light, the card or cards require repair.

Step 9: Ensure all of the switches labeled MUX DI/DO OR CONTROLLER DI are OFF.

Step 10: Press the SCAN switch. The NONE ACTIVE indicator of the DI STATUS indicators lights. If the NONE ACTIVE indicator does not light, or if another of the DI STATUS indicators lights, the MPU card or the discrete I/O card requires repair.

Step 11: Press Switch 1 of the calibrator switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators lights. If the 1 ACTIVE indicator of the DI STATUS does not light. The MPU card or the discrete I/O card requires repair.

Step 12: Press Switch 2 of the calibrator switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators goes out and the > 1 ACTIVE indicator lights. If the > 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the MPU card or the discrete I/O card requires repair.

Step 13: Press both of the MUX DI/DO OR CONTROLLER DI switches again to turn them off. The > 1 ACTIVE indicator of the DI STATUS indicators goes out and the NONE ACTIVE indicator lights. If the > 1 ACTIVE indicator fails to go out or the NONE ACTIVE indicator fails to light, the MPU card or the discrete I/O card requires repair.

Step 14: Repeat Step 11 for MUX DI/DO OR CONTROLLER DI switches 3 and 4 to test discrete inputs 3 and 4. If a discrete I/O card is present, repeat Step 11 for MUX DI/DO OR CONTROLLER DI switches 5 thru 8 to test discrete inputs 5 thru 8 (be sure to turn each switch OFF before turning the next switch ON).

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Remove the MPU card and the discrete I/O card (if one is present).

5.1.2 Process I/O Card

Use the following procedure to calibrate the Process I/O card.

5.1.2.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.1.2.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the process I/O card shown in Figure 5-3, in the test slot labeled PIO1.

Note

The calibrator test slot labeled PIO2 does not allow calibration. It is for configuration purposes only.

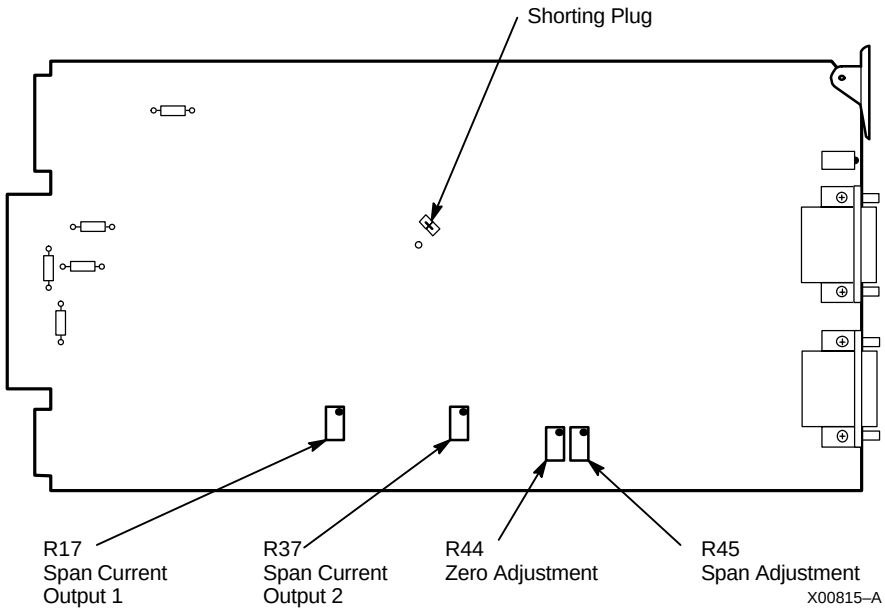

Figure 5-3. Type CL6003 Interactive Controller Discrete I/O Card

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light within one minute, the process I/O card requires repair.

Step 5: Ensure the INT/EXT switch is set to INT.

Step 6: Press the CAL LOW switch.

Step 7: Observe the CAL STATUS indicators and adjust the ZERO (R44) potentiometer on the process I/O card to the mid range of settings over which the OK indicator lights.

Step 8: Press the CAL HIGH switch.

Step 9: Observe the CAL STATUS indicators and adjust the SPAN (R45) potentiometer on the process I/O card to the mid range of settings over which the OK indicator lights.

Step 10: Repeat Steps 6 thru 9 until proper indications occur without adjustments on any step.

Step 11: Connect jumpers from the +CO2 and –CO2 breakout terminals to the 250 ohm LOAD terminals. Ensure the calibrator is in the CAL HIGH mode.

Step 12: Connect the voltmeter across the 250 ohm LOAD terminals. The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the process I/O card Current Output 2 SPAN (R37) potentiometer for the proper reading.

Step 13: Disconnect the jumpers from +CO2 and –CO2 breakout terminals and connect the jumpers to the +CO1 and –CO1 breakout terminals. The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the process I/O card Current Output 1 SPAN (R17) potentiometer for the proper reading.

Step 14: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the process I/O card requires repair.

Step 15: Disconnect the jumpers from the +CO1 and –CO1 breakout terminals and connect the jumpers to the +CO2 and –CO2 breakout terminals. The voltmeter should read 1.00 ± 0.02 volts dc. If not, process I/O card requires repair.

Step 16: Press the SCAN switch and observe the CAL STATUS indicators. The OK indicator should light. If the SCAN ERROR indicator lights repeat Steps 8 thru 16 to produce the proper indication.

Step 17: Disconnect the voltmeter and jumpers.

Step 18: Set the calibrator ON/OFF switch to OFF.

Step 19: Remove the process I/O card.

5.2 Type CL6011 Interactive Controller Card

The calibration procedure for the interactive controller consists of two separate procedures. The interactive controller is not calibrated as a single unit. The MPU card and discrete I/O card (if present) are tested together. This is a functional test, there are no user adjustments on these cards. Only one process I/O card may be calibrated at a time. The calibration procedure for the process I/O card allows the user to adjust the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuit. It also allows the measurement of the 0 percent and 100 percent values of the analog current outputs and the adjustment of the 100 percent values of the analog current outputs.

5.2.1 MPU Card

Use the following procedure to calibrate the MPU card.

5.2.1.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.2.1.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the MPU card shown in Figure 5-4, in the test slot labeled MPU. If a discrete I/O card shown in Figure 5-5, is present, insert it in the test slot labeled DIO. Ensure the switch on the front of the MPU card is in the UP position.

Figure 5-4. Type CL6011 Interactive Controller MPU Unit

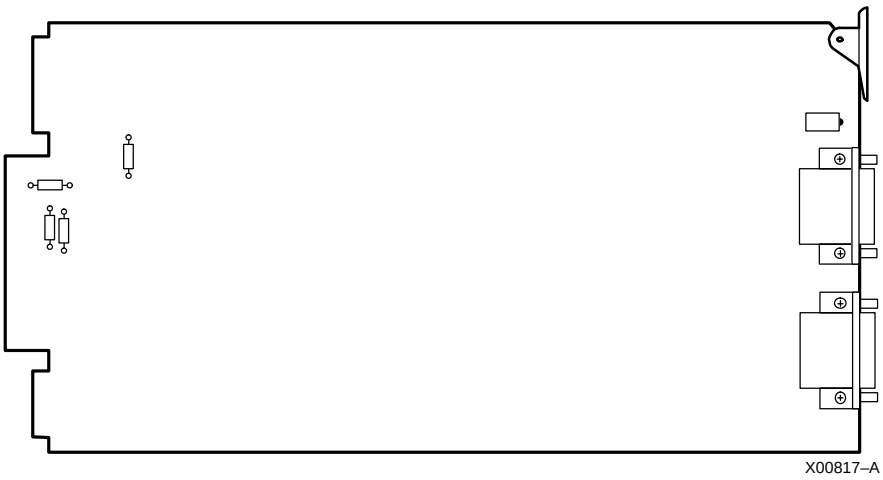

Figure 5-5. Type CL6011 Interactive Controller Discrete I/O Card

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light within one minute, the MPU and discrete I/O cards require repair.

Step 5: Press the CAL LOW switch.

Note

The SCAN ERROR indicator may be lit while the calibrator is in the CAL LOW mode. This is a normal condition.

Step 6: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 thru 4 light up sequentially and then repeat the sequence. If a discrete I/O card is also being tested, CONTROLLER DO indicators 5 thru 8 are also part of the sequence. If some or all of the CONTROLLER DO indicators fail to light or light in an incorrect sequence, the MPU card or discrete I/O card requires repair.

Step 7: Press the CAL HIGH switch.

Note

The SCAN ERROR indicator may be lit while the calibrator is in the CAL HIGH mode. This is a normal condition.

Step 8: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 thru 4 blink on and off as the discrete outputs are subjected to a binary counting test. If a discrete I/O card is also being tested, CONTROLLER DO indicators 5 thru 8 are included in the binary counting test. If some or all of the CONTROLLER DO indicators fail to light, the card or cards require repair.

Step 9: Ensure that all switches labeled MUX DI/DO OR CONTROLLER DI are OFF.

Step 10: Press the SCAN switch. The NONE ACTIVE indicator of the DI STATUS indicators lights. If the NONE ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the MPU card or the discrete I/O card requires repair.

Step 11: Press Switch 1 of the switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators lights. If the 1 ACTIVE indicator of the DI STATUS does not light, the MPU card or the discrete I/O card requires repair.

Step 12: Press Switch 2 of the switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators goes out and the > 1 ACTIVE indicator lights. If the > 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the MPU card or the discrete I/O card requires repair.

Step 13: Press both of the MUX DI/DO OR CONTROLLER DI switches again to turn them off. The > 1 ACTIVE indicator of the DI STATUS indicators goes out and the NONE ACTIVE indicator lights. If the > 1 ACTIVE indicator fails to go out or the NONE ACTIVE indicator fails to light, the MPU card or the discrete I/O card requires repair.

Step 14: Repeat Step 11 for MUX DI/DO OR CONTROLLER DI switches 3 and 4 to test discrete inputs 3 and 4. If a discrete I/O card is present, repeat Step 11 for MUX DI/DO OR CONTROLLER DI switches 5 thru 8 to test discrete inputs 5 thru 8 (be sure to turn each switch OFF before turning the next switch ON).

Step 15: Set the calibrator ON/OFF switch to OFF.

Step 16: Remove the MPU card and the discrete I/O card (if one is present).

5.2.2 Process I/O Card

Use the following procedure to calibrate the Process I/O card.

5.2.2.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.2.2.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the process I/O card shown in Figure 5-6, in the test slot labeled PIO1.

Note

The calibrator test slot labeled PIO2 does not allow calibration. It is for configuration purposes only.

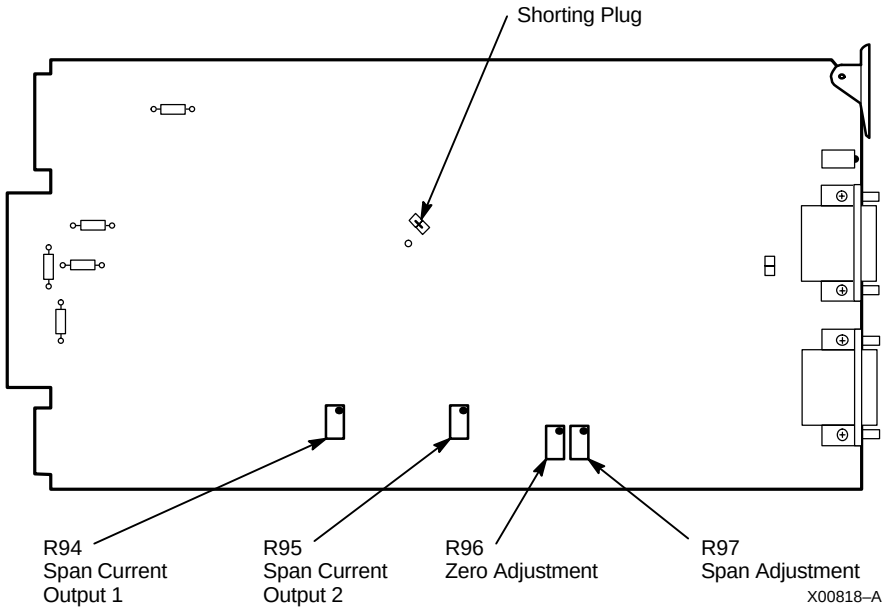

Figure 5-6. Type CL6011 Interactive Controller Process I/O Card

Step 3: Install a 250 ohm resistor (user supplied) across +CO1 and –CO1 breakdown terminals. Install a 250 ohm resistor (user supplied) across +CO2 and –CO2 breakout terminals.

Step 4: Set the calibrator ON/OFF switch to ON.

Step 5: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light within one minute, the process I/O card requires repair.

Step 6: Ensure the INT/EXT switch is set to INT.

Step 7: Press the CAL LOW switch.

Step 8: Observe the CAL STATUS indicators and adjust the ZERO (R96) potentiometer on the process I/O card to the mid range of settings over which the OK indicator lights.

Step 9: Press the CAL HIGH switch.

Step 10: Observe the CAL STATUS indicators and adjust the SPAN (R97) potentiometer on the process I/O card to the mid range of settings over which the OK indicator lights.

Step 11: Repeat Steps 7 thru 10 until proper indications occur without adjustment on any step.

Step 12: Connect a voltmeter across the +CO2 and –CO2 breakout terminals. Ensure the calibrator is in the CAL HIGH mode. The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the process I/O card Current Output 2 SPAN (R95) potentiometer to obtain the proper reading.

Step 13: Disconnect the voltmeter from the +CO2 and –CO2 breakout terminals and connect the voltmeter across the +CO1 and –CO2 breakout terminals. The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the process I/O card Current Output 1 SPAN (R94) potentiometer to obtain the proper reading.

Step 14: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the process I/O card requires repair.

Step 15: Disconnect the voltmeter from the +CO1 and –CO2 breakout terminals and connect the voltmeter across the +CO2 and –CO2 breakout terminals. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the process I/O card requires repair.

Step 16: Press the SCAN switch and observe the calibrator CAL STATUS indicators. The OK indicator should light. If the SCAN ERROR indicator lights, repeat Steps 9 thru 16 to obtain the proper indication.

Step 17: Disconnect the voltmeter and resistors.

Step 18: Set the calibrator ON/OFF switch to OFF.

Step 19: Remove the process I/O card.

5.3 Type CL6201 Configurable Controller Card

This calibration procedure for the configurable controller allows the user to calibrate the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuits. It also allows the measurement of the 0 percent and 100 percent values of the analog current output and the adjustment of the 100 percent analog current output. If a discrete I/O module is present on the configurable controller, the discrete inputs and outputs may also be checked.

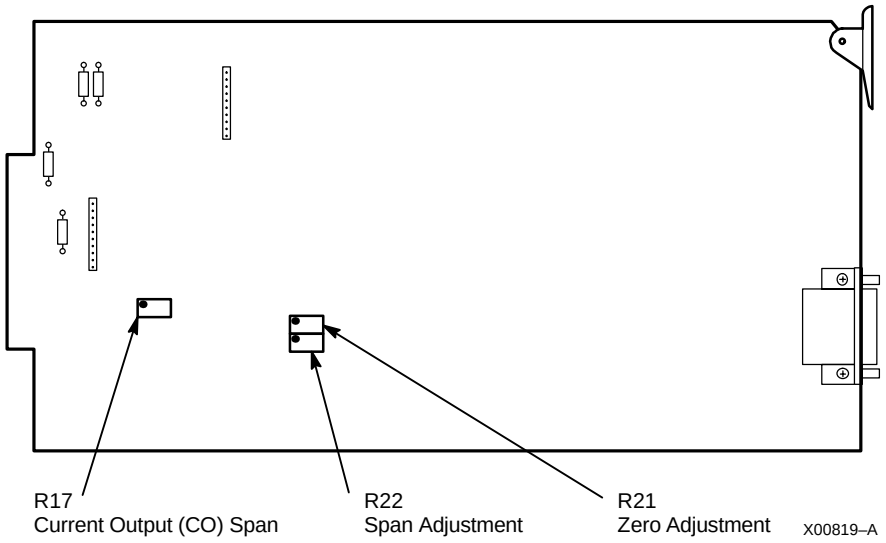

Figure 5-7. Type CL6201 Configurable Controller Unit (Old Style)

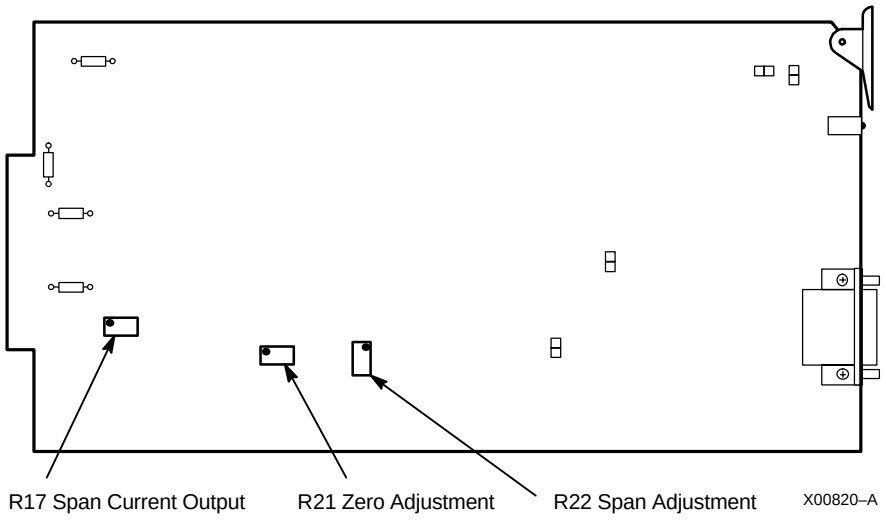

Figure 5-8. Type CL6201 Configurable Controller Unit (New Style)

5.3.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.3.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the configurable controller card shown in Figure 5-7 or Figure 5-8 in the test slot labeled CONFIG SVCE XFER IND.

Step 3: If the configurable controller card has a discrete I/O module shown in Figure 5-9, remove selector plug S1 and connect the cable labeled CONFIG between the selector plug receptacle on the discrete I/O module and the calibrator receptacle labeled CONFIG UMB.

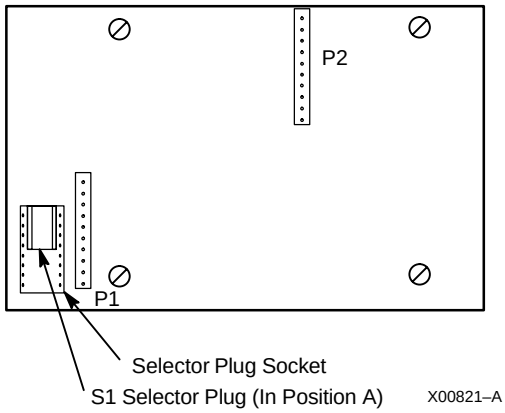

Figure 5-9. Type CL6201 Configurable Controller Discrete I/O Module

Step 4: Set the calibrator ON/OFF switch to ON.

Step 5: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light in one minute, the configurable controller card requires repair.

Step 6: Ensure the INT/EXT switch is set to INT.

Step 7: Press the CAL LOW switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the ZERO (R21) potentiometer on the configurable controller card to the mid range of settings over which the OK indicator lights.

Step 8: If the configurable controller card does not have discrete I/O, skip to Step 9. Otherwise, observe that CONTROLLER DO indicators 1 thru 7 light up in sequence and then repeat the cycle. If the CONTROLLER DO indicators fail to light, or light in an improper sequence, the configurable controller card requires repair.

Step 9: Press the CAL HIGH mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the SPAN (R22) potentiometer on the configurable controller card to the mid range of settings over which the OK indicator lights.

Step 10: If the configurable controller card does not have discrete I/O, skip to Step 11. Otherwise observe that CONTROLLER DO indicators 1 thru 7 blink on and off in a binary counting test. If some or all of the seven CONTROLLER DO indicators do not blink on and off, the configurable controller requires repair.

Step 11: Repeat Steps 7 thru 10 until the proper indications occur without adjustment on any step.

Step 12: Connect jumpers from the +CO1 and –CO1 breakout terminals to the 250 ohm LOAD terminals.

Step 13: Connect the voltmeter across the 250 ohm LOAD terminals (ensure the calibrator is in the CAL HIGH mode). The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the configurable controller card Current Output SPAN (R17) potentiometer to produce the proper reading.

Step 14: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the configurable controller requires repair.

Step 15: Press the SCAN mode switch. The OK indicator of the CAL STATUS indicators should light. If the SCAN ERROR indicator of the CAL STATUS indicators lights, repeat Steps 7 thru 11 and then repeat this step.

Step 16: If the configurable controller card does not have discrete I/O, skip to Step 20. Otherwise, press Switch 1 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators should light. If the 1 ACTIVE indicator fails to light or if another indicator lights, the configurable controller card requires repair.

Step 17: Press Switch 2 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator goes out and the > 1 ACTIVE indicator should light. If the > 1 ACTIVE indicator fails to light or if another indicator lights, the configurable controller requires repair.

Step 18: Press both of the lit MUX DI/DO CONTROLLER DI data switches again to switch them OFF. The > 1 ACTIVE indicator goes out and the NONE ACTIVE indicator of the DI STATUS indicators lights. If the NONE ACTIVE indicator fails to light or if another DI STATUS indicator lights, the configurable controller requires repair.

Step 19: Disconnect the voltmeter.

Step 20: Set the calibrator ON/OFF switch to OFF.

Step 21: Disconnect the cable (if one is present) and remove the configurable controller card. Replace the selector plug if necessary.

5

5.4 Type CL6202 Computing Controller Card

This calibration procedure for the computing controller allows the user to calibrate the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuit. It also allows the measurement of the 0 percent and 100 percent values of the analog current output and the adjustment of the 100 percent analog current output. The procedure tests the discrete inputs and outputs on the computing controller.

5.4.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

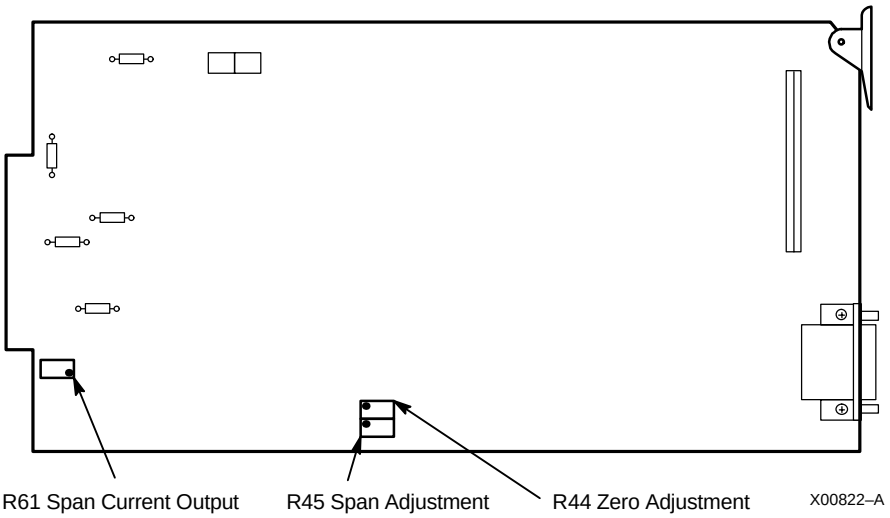

Figure 5-10. Type CL6202 Computing Controller Unit

5.4.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the computing controller card shown in Figure 5-10, in the test slot labeled COMPUTING.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light in one minute, the computing controller card requires repair.

Step 5: Ensure the INT/EXT switch is set to INT.

Step 6: Connect jumpers from the +CO1 and –CO1 breakout terminals to the 250 ohm LOAD terminals.

Step 7: Connect the voltmeter across the 250 ohm LOAD terminals.

Step 8: Press the CAL LOW mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the ZERO (R44) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 9: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 light in sequence and then repeat the cycle. If the CONTROLLER DO indicators fail to light or light in the wrong sequence, the computing controller card requires repair.

Step 10: Press the CAL HIGH mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the SPAN (R45) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 11: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 blink on and off in a binary counting test. If CONTROLLER DO indicators 1 and 2 fail to blink on and off, the computing controller requires repair.

Step 12: Repeat Steps 8 thru 11 until proper indications occur without adjustment on any step.

Step 13: Observe the voltmeter (ensure the calibrator is still in the CAL HIGH mode). The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the computing controller card Current Output SPAN (R61) potentiometer to obtain the proper reading.

Step 14: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the computing controller requires repair.

Step 15: Press the SCAN mode switch. The OK indicator of the CAL STATUS indicators should light. If the SCAN ERROR indicator of the CAL STATUS indicators lights, repeat Steps 8 thru 11 and then repeat this step.

Step 16: Press Switch 1 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators should light. If the 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 17: Press Switch 2 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator goes out and the > 1 ACTIVE indicator should light. If the > 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 18: Press both of the lit MUX DI/DO OR CONTROLLER DI data switches again to switch them OFF. The > 1 ACTIVE indicator goes out and the NONE ACTIVE indicator of the DI STATUS indicators should light. If the NONE ACTIVE indicator fails to light, or if another DI STATUS indicator lights, the computing controller card requires repair.

Step 19: Repeat Steps 16 thru 18 for MUX DI/DO OR CONTROLLER DI data Switches 3 and 4.

Step 20: Disconnect the jumpers and voltmeter.

Step 21: Set the calibrator ON/OFF switch to OFF.

Step 22: Remove the computing controller card.

5.5 Type CL7011 Computing Controller Card (without Dual Current Output)

This calibration procedure for the computing controller allows the user to calibrate the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuit. It also allows the measurement of the 0 percent and 100 percent values of the two analog outputs and the adjustment of the 100 percent analog current outputs. The procedure tests the discrete inputs and outputs on the computing controller.

5.5.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

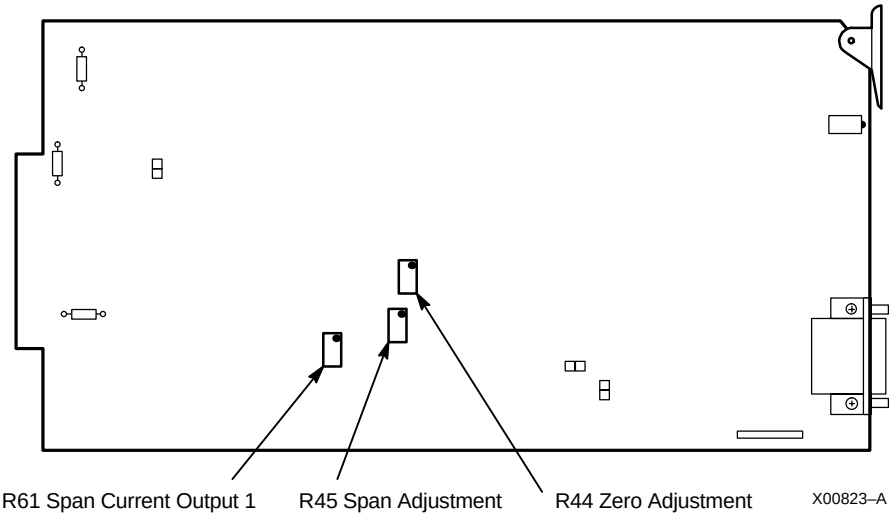

Figure 5-11. Type CL7011 Computing Controller Unit (Without Dual Current Output)

5.5.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the computing controller card shown in Figure 5-11, in the test slot labeled COMPUTING.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator should light. If the COMPLETE indicator fails to light in one minute, the computing controller card requires repair.

Step 5: Ensure the INT/EXT switch is set to INT.

Step 6: Connect jumpers from the +CO1 and –CO1 breakout terminals to the 250 ohm LOAD terminals.

Step 7: Connect the voltmeter across the 250 ohm LOAD terminals.

Step 8: Press the CAL LOW mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the ZERO (R44) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 9: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 light up in sequence and then repeat the cycle. If the CONTROLLER DO indicators fail to light or light in the wrong sequence, the computing controller card requires repair.

Step 10: Press the CAL HIGH mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the SPAN (R45) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 11: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 blink on and off in a binary counting test. If CONTROLLER DO indicators 1 and 2 fail to blink on and off, the computing controller requires repair.

Step 12: Repeat Steps 8 thru 11 until the proper readings occur without adjustments on any step.

Step 13: Observe the voltmeter (ensure the calibrator is still in the CAL HIGH mode). The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the computing controller card Current Output 1 (CO1) SPAN (R61) potentiometer to obtain the proper reading.

Step 14: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the computing controller requires repair.

Step 15: Press the SCAN mode switch. The OK indicator of the CAL STATUS indicators should light. If the SCAN ERROR indicator of the CAL STATUS indicators lights, repeat Steps 8 and 11 and then repeat this step.

Step 16: Press Switch 1 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators should light. If the 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 17: Press Switch 2 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator goes out and the > 1 ACTIVE indicator should light. If the > 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 18: Press both of the lit MUX DI/DO OR CONTROLLER DI data switches again to switch them OFF. The > 1 ACTIVE indicator goes out and the NONE ACTIVE indicator of the DI STATUS indicators should light. If the NONE ACTIVE indicator fails to light, or if another DI STATUS indicator lights, the computing controller card requires repair.

Step 19: Repeat Steps 16 thru 18 for MUX DI/DO OR CONTROLLER DI data Switches 3 and 4.

Step 20: Disconnect the jumpers and voltmeter.

Step 21: Set the calibrator ON/OFF switch to OFF.

Step 22: Remove the computing controller card.

5.6 Type CL7011 Computing Controller Card (with Dual Current Output)

This calibration procedure for the computing controller allows the user to calibrate the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuit. It also allows the measurement of the 0 percent and 100 percent values of the two analog outputs and the adjustment of the 100 percent analog current outputs. The procedure tests the discrete inputs and outputs on the computing controller.

5.6.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

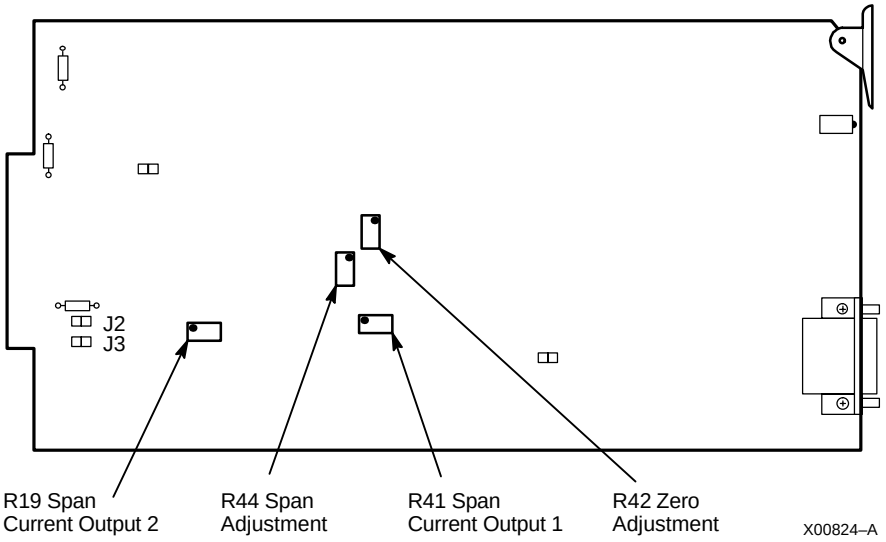

Figure 5-12. Type CL7011 Computing Controller Unit (With Dual Current Output)

5.6.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: On the computing controller card ensure that J2 and J3 are in the pin 2 to pin 3 position for current out.

Step 2: Verify that the calibrator ON/OFF switch is OFF.

Step 3: Insert the computing controller card shown in Figure 5-12, in the test slot labeled COMPUTING.

Step 4: Set the calibrator ON/OFF switch to ON.

Step 5: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator should light. If the COMPLETE indicator fails to light in one minute, the computing controller card requires repair.

Step 6: Ensure the INT/EXT switch is set to INT.

Step 7: Connect jumpers from the +CO1 and –CO1 breakout terminals to the 250 ohm LOAD terminals.

Step 8: Connect the voltmeter across the 250 ohm LOAD terminals.

Step 9: Press the CAL LOW mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the ZERO (R42) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 10: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 light up in sequence and then repeat the cycle. If the CONTROLLER DO indicators fail to light or light in the wrong sequence, the computing controller card requires repair.

Step 11: Press the CAL HIGH mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the SPAN (R44) potentiometer on the computing controller card to the mid range of settings over which the OK indicator lights.

Step 12: Observe the CONTROLLER DO indicators. CONTROLLER DO indicators 1 and 2 blink on and off in a binary counting test. If CONTROLLER DO indicators 1 and 2 fail to blink on and off, the computing controller requires repair.

Step 13: Repeat Steps 9 thru 12 until the proper readings occur without adjustments on any step.

Step 14: Observe the voltmeter (ensure the calibrator is still in the CAL HIGH mode). The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the computing controller card Current Output 1 (CO1) SPAN (R41) potentiometer to obtain the proper reading.

Step 15: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the computing controller requires repair.

Step 16: Disconnect the jumpers and voltmeter from +CO1 and –CO1 breakout terminals and 250 ohm LOAD. Connect the voltmeter across the +VO and –VO breakout terminals.

Step 17: Press the CAL HIGH mode switch and observe the voltmeter. The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the computing controller card Current Output 2 (CO2) SPAN (R19) potentiometer to obtain the proper reading.

Step 18: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the computing controller requires repair.

Step 19: Press the SCAN mode switch. The OK indicator of the CAL STATUS indicators should light. If the SCAN ERROR indicator of the CAL STATUS indicators lights, repeat Steps 9 thru 12 and then repeat this step.

Step 20: Press Switch 1 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator of the DI STATUS indicators should light. If the 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 21: Press Switch 2 of the data switches labeled MUX DI/DO OR CONTROLLER DI. The 1 ACTIVE indicator goes out and the > 1 ACTIVE indicator should light. If the > 1 ACTIVE indicator fails to light, or if another of the DI STATUS indicators lights, the computing controller card requires repair.

Step 22: Press both of the lit MUX DI/DO OR CONTROLLER DI data switches again to switch them OFF. The > 1 ACTIVE indicator goes out and the NONE ACTIVE indicator of the DI STATUS indicators should light. If the NONE ACTIVE indicator fails to light, or if another of the DI STATUS indicator lights, the computing controller card requires repair.

Step 23: Repeat Steps 20 thru 22 for MUX DI/DO OR CONTROLLER DI data Switches 3 and 4.

Step 24: Disconnect the jumpers and voltmeter.

Step 25: Set the calibrator ON/OFF switch to OFF.

Step 26: Remove the computing controller card.

Step 27: If J2 and J3 were moved in Step 1, return them to their original position.

5.7 Types CL7311 and CL7312 Redundant Manual Control Cards

This calibration procedure for the redundant manual card allows the user to calibrate the 0 percent (ZERO) and 100 percent (SPAN) voltage levels of the analog-to-digital conversion circuits. It also allows the measurement of the 0 percent and 100 percent values of the analog current output and the adjustment of the 100 percent analog current output.

5.7.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter
- Redundant Manual Adapter Card PN29A2362 (part of the Type CS6003 Calibrator)

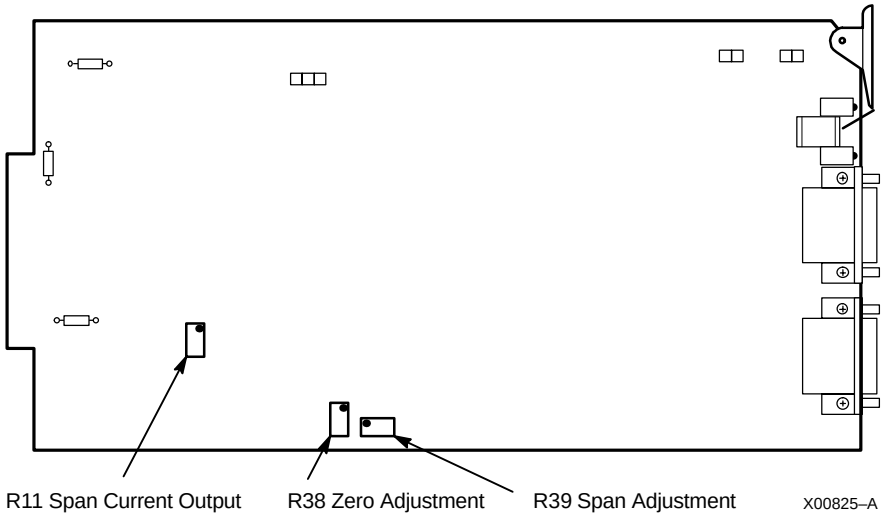

Figure 5-13. Type CL7311/CL7312 Redundant Manual Control Unit

5.7.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Using the redundant manual adapter card, insert the redundant manual card shown in Figure 5-13, in the test slot labeled CONFIG SVCE XFER IND.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit. The green LED on the front of the redundant manual card goes out (the LED may or may not be lit) until the card self-test is finished. When finished the green LED on the redundant manual card should light. If the green LED fails to light in one minute, the redundant manual card requires repair.

Step 5: Ensure the INT/EXT switch is set to INT.

Step 6: Press the CAL LOW switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the ZERO (R38) potentiometer on the redundant manual card to the mid range of settings over which the OK indicator lights.

Step 7: Press the CAL HIGH mode switch. The OK indicator of the CAL STATUS indicators should light. If not, adjust the SPAN (R39) potentiometer on the redundant manual card to the mid range of settings over which the OK indicator lights.

Step 8: Repeat Steps 6 and 7 until readings occur without adjustments on any step.

Step 9: Connect jumpers from the +CO1 and –CO1 breakout terminals to the 250 ohm LOAD terminals.

Step 10: Connect the voltmeter across the 250 ohm LOAD terminals (ensure the calibrator is still in the CAL HIGH mode). The voltmeter should read 5.00 ± 0.01 volts dc. If not, adjust the redundant manual card Current Output SPAN (R11) potentiometer to obtain the proper reading.

Step 11: Press the CAL LOW mode switch and observe the voltmeter. The voltmeter should read 1.00 ± 0.02 volts dc. If not, the redundant manual card requires repair.

Step 12: Press the SCAN mode switch. The OK indicator of the CAL STATUS indicators should light. If the SCAN ERROR indicator of the CAL STATUS indicators lights, repeat Steps 6 thru 8 and then repeat this step.

Step 13: Set the calibrator ON/OFF switch to OFF.

Step 14: Remove the redundant manual card and adapter card from the calibrator.

5.8 Type CN6201 Indicator Card

This calibration procedure for the indicator card allows the user to set the 0 percent (ZERO) and 100 percent (SPAN) voltage levels on the card.

5.8.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

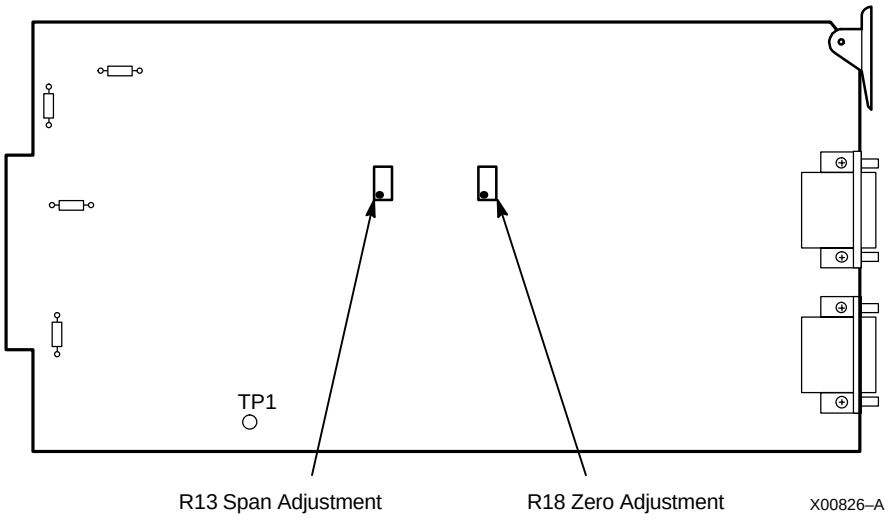

Figure 5-14. Type CN6201 Indicator Unit

5.8.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the indicator card shown in Figure 5-14, in the test slot labeled CONFIG SVCE XFER IND.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Connect the voltmeter between test point TP1 on the indicator card and the –CO1 breakout terminal on the calibrator.

Step 5: Ensure the INT/EXT switch is set to INT.

Step 6: Press the CAL LOW switch. The voltmeter should read 0.995 ± 0.003 volts dc. If not, adjust the ZERO (R18) potentiometer on the indicator card to obtain the proper reading.

Step 7: Press the CAL HIGH switch. The voltmeter should read 4.975 ± 0.003 volts dc. If not, adjust the SPAN (R13) potentiometer on the indicator card to obtain the proper reading.

Step 8: Because the ZERO and SPAN adjustments interact, repeat Steps 6 and 7 until the proper readings are obtained without an adjustment on any step.

Step 9: Disconnect the voltmeter.

Step 10: Set the calibrator ON/OFF switch to OFF.

Step 11: Remove the indicator card.

5.9 Type CP7202 Controller Power Conversion Card

This calibration procedure for the controller power conversion card allows the user to adjust the output voltage levels and the alarm trip points. Adjustments are made by observing the voltmeter and the RESET TEST and RELAY TEST indicators on the calibrator, and then adjusting potentiometers on the power conversion card.

5.9.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

Caution

The R11 potentiometer on the controller power conversion card is not user adjustable. It is set at the factory and should never be readjusted.

5.9.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the controller power conversion card shown in Figure 5-15 or Figure 5-16, in the test slot labeled CONT POWER CARD.

Step 3: Set the calibrator ON/OFF switch to ON and allow five minutes for the power conversion card to stabilize.

Note

If the calibrator does not turn on, return to Step 1. Remove fuse F1 on the controller power conversion card and proceed to Step 3. Complete Step 3, reinstall the fuse, and allow the card to stabilize.

Step 4: On the controller power conversion card, connect a jumper between the banded end of diode CR10 and the top of resistor R15 (left side of R15 for new cards).

Step 5: Connect the voltmeter between test point TP1 and the common (COM) test jack on the front of the controller power conversion card. The voltmeter should read 4.900 $\pm$ 0.005 volts dc. If not, adjust SUPV (R22) potentiometer on the controller power conversion card to obtain the proper reading.

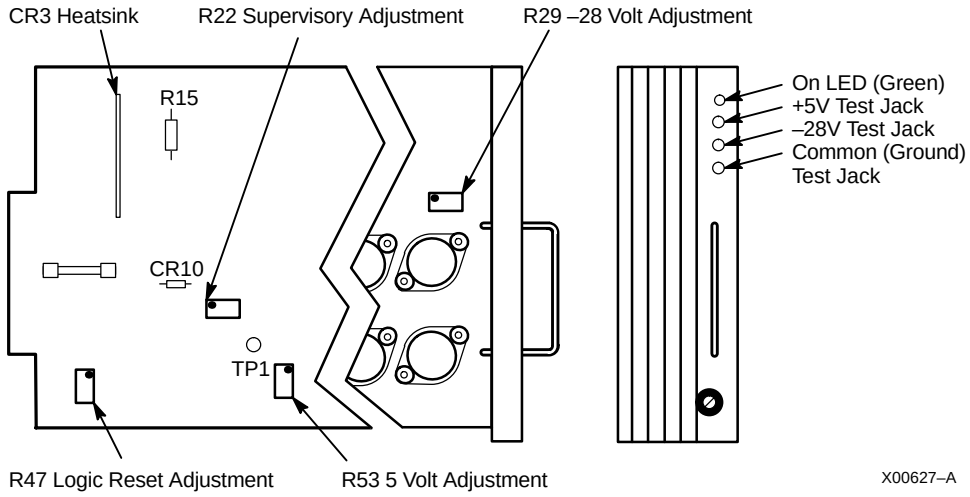

Figure 5-15. Type CP7202 Controller Power Conversion Card (Old Style)

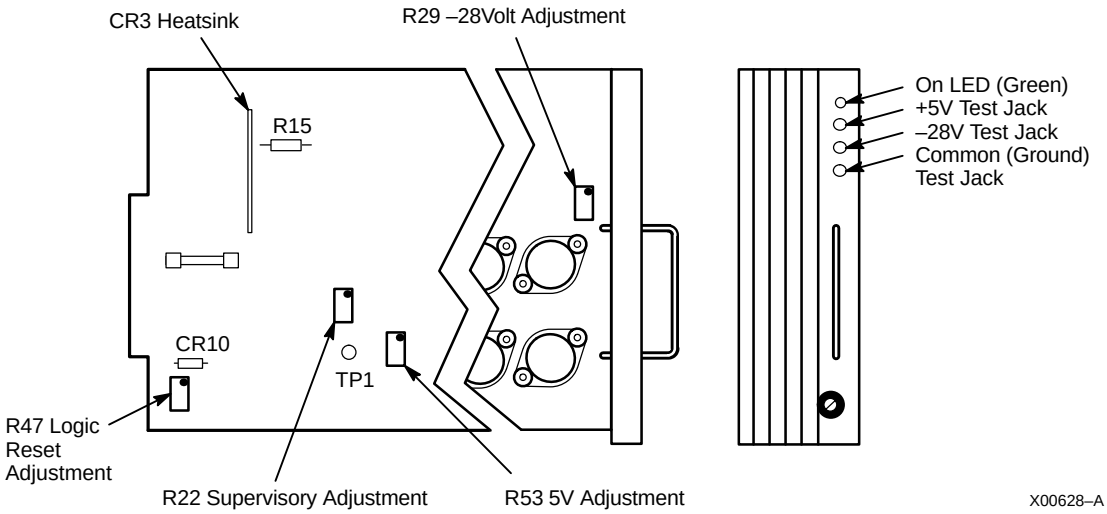

Figure 5-16. Type CP7202 Controller Power Conversion Card (New Style)

Note

Due to an isolation diode, the +5V test jack does not give a true reading. Use only the CR3 heatsink for calibration readings.

Step 6: Connect the voltmeter between the heatsink (cathode) of diode CR3 and the common (COM) test jack on the front of the controller power conversion card. The voltmeter should read 4.85 ± 0.015 volts dc. If not, adjust the 5 VOLT (R53) potentiometer on the controller power conversion card to obtain the proper reading.

Step 7: Adjust the LOGIC RESET (R47) potentiometer on the controller power conversion card until the RESET TEST indicator on the calibrator lights and then back off the potentiometer until the indicator just goes out.

Note

The ON indicator on the controller power conversion card and the RELAY TEST indicator on the calibrator should follow the RESET TEST indicator during these steps.

Step 8: Adjust the 5 VOLT (R53) potentiometer on the controller power conversion card until the voltmeter reads between 4.99 and 5.10 volts dc. The RESET TEST indicator should light. If not, the controller power conversion card requires repair.

Step 9: Adjust the 5 VOLT (R53) potentiometer on the controller power conversion card until the RESET TEST indicator just goes out. The voltmeter should read 4.850 ± 0.015 volts dc. If not, repeat Steps 6 thru 9 until the proper reading is obtained.

Step 10: Adjust the 5 VOLT (R53) potentiometer on the controller power conversion card until the voltmeter reads 5.180 ± 0.005 volts dc.

Step 11: Connect the voltmeter between pin 41 (fifth pin from the bottom on the component side of the card) on the backedge connector of the controller power conversion card and the common (COM) test jack on the front of the controller power conversion card. The voltmeter should read –28.00 ± 0.05 volts dc. If not, adjust the –28 VOLT (R29) potentiometer on the controller power conversion card to obtain the proper reading.

Step 12: Disconnect the voltmeter and jumper. The ON indicator on the controller power conversion card and the RESET TEST and RELAY TEST indicators on the calibrator should be lit. If not, the controller power conversion card requires repair.

The output voltage levels are now calibrated. The remaining steps set the alarm trip points.

Step 13: On the controller power conversion card, connect a jumper between the banded end of diode CR10 and the top of resistor R15 (left side of R15 on new card).

Step 14: Connect the voltmeter between the heatsink (cathode) of diode CR3 and the common (COM) test jack on the front of the controller power conversion card.

Step 15: Adjust the 5 VOLT (R53) potentiometer until the voltmeter reads between 4.920 and 5.095 volts dc. The ON indicator on the controller power conversion card and the RELAY TEST indicator on the calibrator should go out. If not, the controller power conversion card requires repair.

Step 16: Adjust the 5 VOLT (R53) potentiometer on the controller power conversion card until the voltmeter reads 5.180 ± 0.005 volts dc.

Step 17: Connect the voltmeter between pin 41 on the backedge connector and the common (COM) test jack on the front of the controller power conversion card.

Step 18: Adjust the –28 VOLT (R29) potentiometer on the controller power conversion card until the voltmeter reads between –26.45 and –27.53 volts dc. The ON indicator on the controller power conversion card and the RELAY TEST indicator on the calibrator should go out. If not, the controller power conversion card requires repair.

Step 19: Adjust the –28 VOLT (R29) potentiometer on the controller power conversion card until the voltmeter reads –28.00 ± 0.05 volts dc.

Step 20: Disconnect the voltmeter and jumpers.

Step 21: Set the calibrator ON/OFF switch to OFF.

Step 22: Remove the controller power conversion card.

5.10 Type CS6201 Service Transfer Card

This calibration procedure for the service transfer unit is composed of two separate procedures. One procedure is for the calibration of the service transfer card itself. The other procedure is a functional test of the entire service transfer unit. This functional test simulates the transfer of a process to and from the service transfer unit.

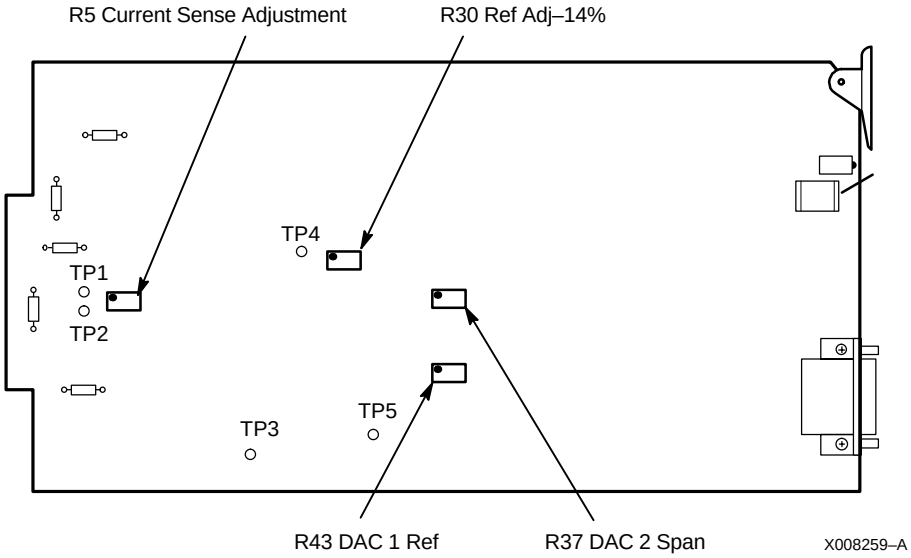

Figure 5-17. Type CS6201 Service Transfer Unit

5.10.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter
- 400 Ohm Resistor
- Current Source

5.10.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the service transfer card shown in Figure 5-17, in the test slot labeled CONFIG SVCE XFER IND.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the COMPLETE indicator lights. If the COMPLETE indicator fails to light within one minute, the service transfer card requires repair.

Step 5: Press the CAL LOW switch.

Step 6: Connect the voltmeter between test points TP5 and TP3 on the service transfer card. The voltmeter should read 4.000 ± 0.0005 volts dc. If not, adjust the service transfer card DAC 1 REF (R43) potentiometer to obtain the proper reading.

Step 7: Connect the 400 ohm resistor between breakout terminals +CO1 and –CO1.

Step 8: Connect the voltmeter between test points TP1 and TP3 on the service transfer card. The voltmeter should read 8.000 ± 0.0005 volts dc. If not, adjust the service transfer card DAC 2 SPAN (R37) potentiometer to obtain the proper reading.

Step 9: Connect the voltmeter between test points TP1 and TP2 on the service transfer card. The voltmeter should read 2.000 ± 0.0005 volts dc. If not adjust the service transfer card CURRENT SENSE (R5) potentiometer to obtain the proper reading.

Step 10: Connect the voltmeter between test points TP3 and TP4 on the service transfer card. The voltmeter should read 0.176 ± 0.0002 volts dc. If not, adjust the service transfer card REF ADJ–14% (R30) potentiometer to obtain the proper reading.

Step 11: Disconnect the voltmeter and remove the 400 ohm resistor.

Step 12: Set the calibrator ON/OFF switch to OFF.

Step 13: Remove the service transfer card.

5.10.3 Functional Test

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the service transfer card in the test slot labeled CONFIG SVCE XFER IND.

Step 3: Insert the service transfer display station in the operator station case.

Step 4: Connect the service transfer cable between the service transfer display station and the connector on the front of the service transfer card.

Step 5: Set the calibrator ON/OFF switch to ON.

Step 6: Press the calibrator RESET switch. The IN PROGRESS indicator lights and remains lit until the card self-test is finished. When finished, the calibrator COMPLETE indicator lights. If the COMPLETE indicator fails to light in one minute, the service transfer card requires repair.

Step 7: Connect the current source across the 250 ohm LOAD breakout terminals.

Step 8: Set the current source output to 12 milliamps.

Step 9: Connect a jumper between the +CO1 breakout terminal and one 250 ohm LOAD terminal and a jumper between the –CO1 breakout terminal and the other 250 ohm LOAD terminal.

Step 10: Set the SVCE XFER TEST switch to CONT IN. The service transfer display station REMOVE CONTROLLER indicator should light. If the REMOVE CONTROLLER indicator does not light, the service transfer unit requires repair.

Step 11: When the REMOVE CONTROLLER indicator lights, disconnect the current source.

Step 12: Set the SVCE XFER TEST switch to CONT OUT. The service transfer display station numerical display should read 50 ± 1. If the service transfer display station numerical display does not read 50 ± 1, the service transfer card requires calibration. If the card has been calibrated and the proper reading is still not obtained, the service transfer card requires repair.

Step 13: Connect the voltmeter across the calibrator 250 ohm LOAD terminals.

Step 14: Use the manual slewing pushbuttons on the service transfer display station to slew the service transfer unit output up an down. When the service transfer display station numerical display reads 100 the voltmeter should read 5.00 ± 0.08 volts dc. When the service transfer display station numerical display reads 0 the voltmeter should read 1.00 ± 0.08 volts dc. If the proper readings are not obtained, ensure the service transfer card is calibrated and repeat the functional test. If the proper readings are still not obtained, the service transfer unit requires repair.

Step 15: Disconnect the voltmeter.

Step 16: Connect the current source across the 250 ohm LOAD terminals (ensure the jumpers to the +CO1 and –CO1 terminals are still in place).

Step 17: Set the SVCE XFER TEST switch to CONT IN. The service transfer display station goes blank and then the DISCONNECT TRANSFER STATION indicator on the service transfer station should light. If the ADJUST CONTROLLER OUTPUT indicator on the service transfer display station lights. Adjust the current source to obtain the proper indication.

Step 18: Disconnect the current source and jumpers.

Step 19: Set the SVCE XFER TEST switch to CONT OUT. The service transfer display station numerical display shows "__ __ __" indicating it is ready for use. If not, the service transfer unit requires repair.

Step 20: Disconnect the service transfer cable.

Step 21: Set the calibrator ON/OFF switch to OFF.

Step 22: Remove the service transfer card and service transfer display station.

5.11 Type DH7010 Power Converter Card

The DH7010 Power Converter Card is used in the local traffic director, network traffic director and the system interface units. This procedure allows the user to calibrate the 5 volt dc output and test the reset and relay outputs of the power converter card.

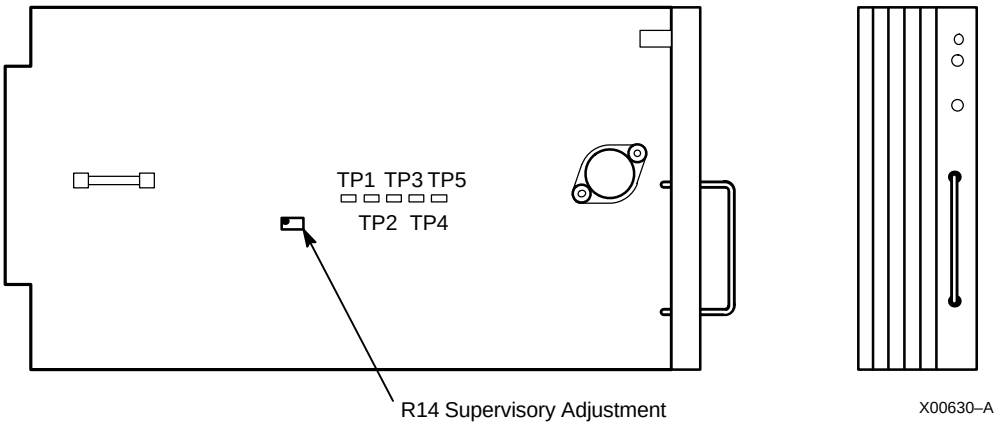

Figure 5-18. Type DH7010 Power Converter Card

5.11.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

5.11.2 Calibration Procedure

Use the following procedure to calibrate the card:

5

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the power converter card shown in Figure 5-18, in the test slot labeled MUX POWER CARD.

Step 3: Set the calibrator ON/OFF switch to ON.

Step 4: Wait 5 minutes for the power converter card to stabilize.

Step 5: Connect the voltmeter between test points TP4 and TP5. The voltmeter should read 4.850 ± 0.010 volts dc. If not, adjust the SUPV (R14) potentiometer to obtain the proper reading.

Step 6: Connect the voltmeter between the +5 and COM test jacks on the front of the card. The voltmeter should read 5.100 ± 0.050 volts dc. If not, the power converter card needs repair.

Step 7: Disconnect the voltmeter. The ON indicator on the power converter card and the RELAY TEST and RESET TEST indicators on the calibrator should light. If not, the power converter card requires repair.

Step 8: Connect a jumper between test points TP2 and TP4.

Step 9: Connect a jumper between test points TP1 and TP3. The ON indicator on the power converter card and the RELAY TEST and RESET TEST indicators on the calibrator should be off. If not, the power converter card requires repair.

Step 10: Disconnect the jumper between test points TP1 and TP3. The ON indicator on the power converter card and the RELAY TEST and RESET TEST indicators on the calibrator should light. If not, the power converter card requires repair.

Step 11: Disconnect the jumper between test points TP2 and TP4.

Step 12: Set the calibrator ON/OFF switch to OFF.

Step 13: Remove the power converter card.

6 Data Highway Cards

This section contains the calibration procedures for:

- Power Converter Card (for Highway Devices)(PN46A4233)
- Power Converter Card (for Highway Devices)(PN41B0985)

6.1 Power Converter Card (for Highway Devices)(PN46A4233)

The calibration procedure for the power converter card, see Figure 6-1, allows the user to calibrate the +5 and +15 volt output levels and check the –12 and –30 volt output levels.

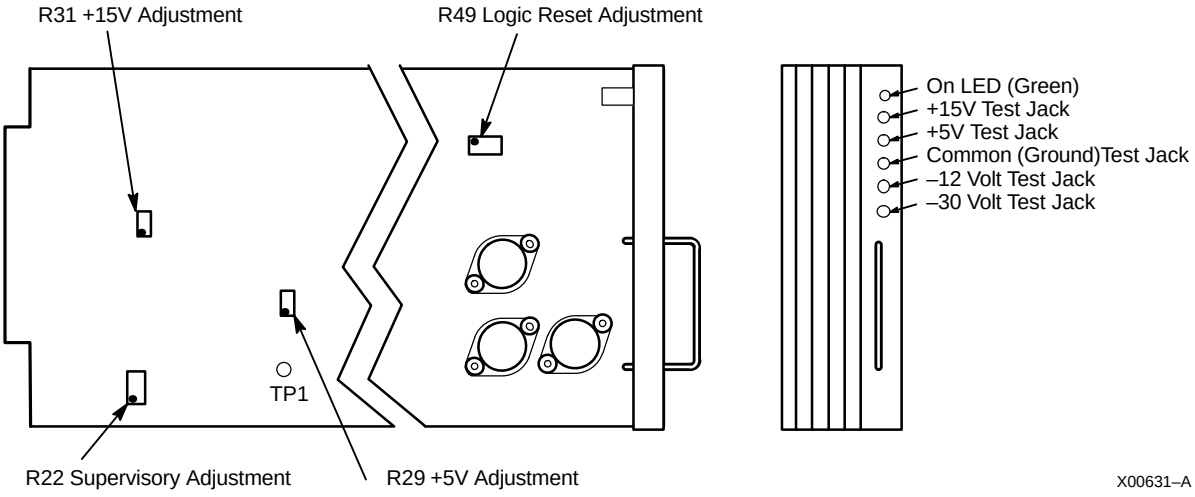

Figure 6-1. Power Converter Card (for Highway Devices)

6.1.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

6.1.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the power converter card shown in Figure 6-2, in the test slot labeled MUX POWER CARD.

Step 3: Connect a jumper between test point TP1 and the common (COM) test jack on the front of the of the power converter card.

Step 4: Set the calibrator ON/OFF switch to ON.

Step 5: Disconnect the jumper and wait five minutes for the card outputs to stabilize.

Step 6: Connect a voltmeter between test point TP1 and the common (COM) test jack on the front of the power converter card. The volt meter should read 3.69 ± 0.015 volts dc. If not, adjust the SUPV (R22) potentiometer to obtain the proper reading.

Step 7: Connect the voltmeter between the +5V and COM test jacks on the front of the power converter card. The voltmeter should read 4.855 ± 0.002 volts dc. If not, adjust the +5 VOLT (R29) potentiometer to obtain the proper reading. If unable to adjust R29 for the proper reading, proceed to Step 17.

Step 8: Adjust the LOGIC RESET (R49) potentiometer on the power converter card until the ON indicator on the power converter card and the RESET TEST and RELAY TEST indicators of the calibrator just go out.

Step 9: Adjust the +5 VOLT (R29) potentiometer on the power converter card until the voltmeter reads at least 4.91 volts dc and the ON indicator on the power converter card and RELAY TEST and RESET TEST indicators on the calibrator light.

Step 10: Adjust the +5 VOLT (R29) potentiometer on the power converter card until the ON indicator on the power converter card and the RESET TEST and RELAY TEST indicators on the calibrator just go out. The voltmeter should read 4.860 ± 0.005 volts dc. If not, repeat Steps 6 thru 10 until the proper reading is obtained.

Step 11: Adjust the +5 VOLT (R29) potentiometer until the voltmeter reads 5.07 ± 0.010 volts dc

Step 12: Connect the voltmeter between the +15V and COM test jacks on the front of the power converter card. The voltmeter should read between 14.05 and 14.60 volts dc and the ON indicator on the front of the power converter card and the RELAY TEST indicator go out. If not, adjust the +15 VOLT (R31) potentiometer on the power converter card to obtain the proper reading.

Step 13: Adjust the +15 VOLT (R31) potentiometer on the power converter card until the voltmeter reads 15.550 ± 0.050 volts dc.

Step 14: Connect the voltmeter between the –12V and COM test jacks on the front of the power converter card. The voltmeter should read –12.000 ± 0.400 volts dc. If not, the power converter card requires repair.

Step 15: Connect the voltmeter between the –30V and COM test jacks on the front of the power converter card. The voltmeter should read between –28.900 and –30.000 volts dc. If not, the power converter card requires repair.

Step 16: Disconnect the voltmeter.

Step 17: Set the calibrator ON/OFF switch to OFF.

Step 18: If a failure occurred in Step 7 continue the procedure. If not, remove the power converter card from the calibrator.

Step 19: Using two eight inch jumpers, connect a 10 to 39K resistor across R1 on the power converter card.

Step 20: Set the calibrator ON/OFF switch to ON.

Step 21: Connect a voltmeter between the +5V and COM test jacks on the power converter card.

Step 22: Adjust the +5V (R29) potentiometer on the power converter card to read 4.855 ± 0.002 volts dc.

Step 23: Adjust the LOGIC RESET (R49) on the power converter card until the ON indicator on the power converter card and the RESET TEST and RELAY TEST indicators on the calibrator just go out.

Step 24: Adjust the +5V (R29) on the power converter card until the voltmeter reads at least 4.910 volts dc and the ON indicator on the power converter card and the RESET TEST and RELAY TEST indicators on the calibrator light.

Step 25: Adjust the +5V (R29) on the power converter card until the ON indicator on the power converter card and the RESET TEST and RELAY TEST indicators on the calibrator just go out. The voltmeter should read 4.855 ± 0.005 volts dc. If not, repeat Steps 22 thru 25 to obtain the proper reading.

Step 26: Set the calibrator ON/OFF switch to OFF.

Step 27: Remove the jumpers and resistor across R1.

Step 28: Set the calibrator ON/OFF switch to ON.

Step 29: Adjust the +5 VOLT (R29) potentiometer until the voltmeter reads 5.07 ± 0.010 volts dc

Step 30: Connect the voltmeter between the +15V and COM test jacks on the front of the power converter card. The voltmeter should read between 14.05 and 14.60 volts dc and the ON indicator on the front of the power converter card and RELAY TEST indicator go out. If not, adjust the +15 VOLT (R31) potentiometer on the power converter card to obtain the proper reading.

Step 31: Adjust the +15 VOLT (R31) potentiometer on the power converter card until the voltmeter reads 15.550 ± 0.050 volts dc.

Step 32: Connect the voltmeter between the –12V and COM test jacks on the front of the power converter card. The voltmeter should read –12.000 ± 0.400 volts dc. If not, the power converter card requires repair.

Step 33: Connect the voltmeter between the –30V and COM test jacks on the front of the power converter card.

Step 34: The voltmeter should read between –28.900 and –30.000 volts dc. If not, the power converter card requires repair.

Step 35: Disconnect the voltmeter.

Step 36: Set the calibrator ON/OFF switch to OFF.

Step 37: Remove the power converter card.

6.2 Power Converter Card (for Highway Devices)(PN41B0985)

The calibration procedure for the power converter card, see Figure 6-2, allows the used to calibrate the +5 and +15 volt output levels and check the –12 and –30 volt output levels.

6.2.1 Equipment Required

The following equipment is required:

- Type CS6003 Calibrator
- Voltmeter

6.2.2 Calibration Procedure

Use the following procedure to calibrate the card:

Step 1: Verify that the calibrator ON/OFF switch is OFF.

Step 2: Insert the power converter card into the test slot labeled MUX POWER CARD.

Step 3: Connect a jumper between test point TP1 and the common (COM) test jack on the front of the power converter card.

Step 4: Set the calibrator ON/OFF switch to ON.

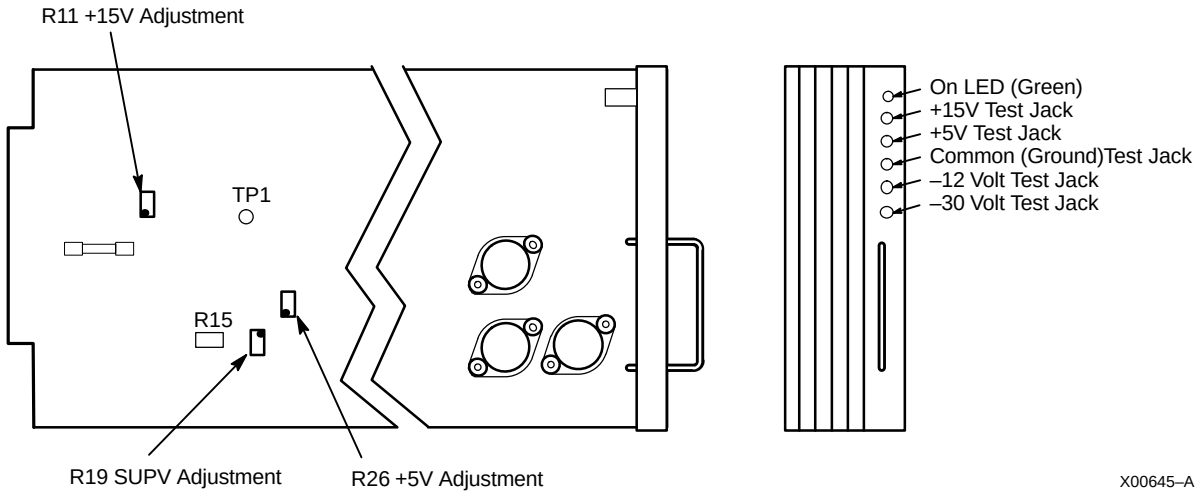

Figure 6-2. Power Converter Card (for Highway Devices) PN41B0985

Step 5: Disconnect the jumper and wait five minutes for the card outputs to stabilize.

Step 6: Connect a voltmeter between test point TP1 and ground (GND) test jack on the power converter card. The voltmeter should read 3.690 ± 0.015 volts dc. If not, adjust the SUPV (R19) potentiometer on the power converter card to obtain the proper reading.

Step 7: Connect a jumper between R15 (end closest to front edge) and GND test jack on the power converter card.

Step 8: Adjust the +5 VOLT (R26) potentiometer for a reading of 4.850 volts dc on the 5 volt dc output. The calibrator RESET TEST and RELAY TEST and the ON indicator on the power converter card should go out. If not, the power converter card requires repair.

Step 9: Adjust the +5 VOLT (R26) potentiometer on the power converter card until the voltmeter reads at least 4.910 volts dc and the ON indicator on the power converter card and RELAY TEST and RESET TEST indicators on the calibrator light.

Step 10: Remove the jumper.

Step 11: Adjust the +5 VOLT (R26) potentiometer on the power converter card until the voltmeter reads 5.070 ± 0.010 volts dc.

Step 12: Connect the voltmeter between the +15V and GND test jacks on the power converter card. The voltmeter should read between 14.050 and 14.600 volts dc and the ON indicator on the power converter card and the RELAY TEST and RESET TEST indicators on the calibrator should go out. If not, adjust the +15 VOLT (R11) potentiometer on the power converter card to obtain the proper reading.

Step 13: Adjust the +15 VOLT (R11) potentiometer on the power converter card for a reading of 15.550 ± 0.050 volts dc on the voltmeter.

Step 14: Connect the voltmeter between the –12V and GND test jacks on the power converter card. The voltmeter should read –12.000 ± 0.400 volts dc. If not, the power converter card requires repair.

Step 15: Connect the voltmeter between the –30V and GND test jacks on the power converter card. The voltmeter should read between –28.900 and –31.000 volts dc. If not, the power converter card requires repair.

Step 16: Disconnect the voltmeter.

Step 17: Set the calibrator ON/OFF switch to OFF.

Step 18: Remove the power converter card.

Appendix A

Maintaining the Calibrator

A.1 Power Supply Status Indicator

The power supply status indicator is located next to the calibrator ON/OFF switch on the front panel. Whenever the ON/OFF switch is set to ON, the power supply status indicator should be lit. If ON/OFF switch is ON and the indicator is not lit, either a line power fuse is open or the calibrator requires repair.

A.2 Fuses

There are three fuses that can be checked and replaced. The ac power fuse is located next to the ON/OFF switch. This fuse is a glass body type fuse and can be visually inspected. To replace a blown fuse follow these steps:

Step 1: Make sure the ac power cord is unplugged.

Step 2: Press the spot marked PRESS on the fuse holder.

Step 3: Remove the fuse holder.

Step 4: Replace the fuse with one of equal rating.

Step 5: Reinstall the fuse holder.

Step 6: Reconnect the ac power cord.

Calibrators that use 100—120 volt ac line power have a 3 amp fuse; those that use 240 volt ac line power have a 1.5 amp fuse.

Fuses for the +24V and +5V breakout terminals are located on the calibrator front panel. They are housed in a fuse holder situated between the double rows of breakout terminals. To check these fuses, unscrew the plastic cover of the fuse holder and remove the fuses from their sockets. The fuses have small glass windows and can be visually inspected. A blown fuse indicates an attempt has been made to draw power from one of the breakout terminals. The +24V and +5V breakout terminals are intended to supply only 75 mA. Each fuse is rated at 1/10 A.

A.3 Lamp Test

The LAMP TEST switch, when pressed, lights all indicators and displays on the calibrator front panel. Before beginning to test or calibrate cards, set the calibrator ON/OFF switch to ON and press the LAMP TEST switch. All of the indicators and other displays on the front panel should light. If they do not, the calibrator requires repair.

A.4 Fan and Filter

The calibrator fan and air filter should be inspected and cleaned at least once every six months and more frequently if exposed to dusty conditions. To remove the fan assembly (includes the air filter) follow these steps:

Step 1: Make sure the ac power cord is unplugged.

Step 2: Remove the six screws securing the calibrator front panel.

Step 3: Remove the front panel.

Step 4: Disconnect the front panel 60 pin ribbon cable at the power supply end.

Step 5: Disconnect the 3 pin molex connector on the wires between the calibrator power supply and the front panel.

Step 6: Remove the screw securing the fan assembly bracket.

Step 7: Disconnect the 2 pin molex connector on the wires leading to the fan.

Step 8: Remove the fan assembly.

When the fan assembly has been removed, the fan should be checked to make sure it will rotate freely. The air filter should be brushed, vacuumed, or otherwise carefully cleaned. If the filter is extremely dirty, it can be removed from the fan assembly and cleaned with soap and water. Dry the filter thoroughly before reinstalling it.

Replace the fan assembly by using the following steps:

Step 1: Position the fan assembly in the case.

Step 2: Connect the 2 pin molex connector to the fan.

Step 3: Secure the fan assembly bracket in place with the screw.

Step 4: Connect the 3 pin molex connector between the power supply and the front panel.

Step 5: Connect the front panel 60 pin ribbon cable to the power supply.

Step 6: Replace the front panel and secure with six screws.

Glossary

A

Absolute Alarm An alarm which is triggered when the signal that is being monitored reaches an absolute level, as opposed to a level which is relative to another value. High Alarms and Low Alarms are types of absolute alarms. [See Deviation Alarm.]

ACIA Acronym: Asynchronous Communications Interface Adapter

ACK Abbreviation: Acknowledge

Acknowledge (ACK)
To respond to an alarm or other indicator of an unusual condition. Operators of PROVOX systems can acknowledge alarms themselves. Optionally, in many situations, the system can acknowledge alarms automatically.

ac^2 Trademark of Fisher Controls for the product line of analog control instruments that preceded the PROVOX product line. The trademark is an acronym for ***analog control center***.

A/D Acronym: Analog-to-Digital, or Analog to Digital Converter

Adaptive Gain A type of primary control algorithm which allows the proportional gain to change based on the value of an analog signal, a discrete signal, the process variable, the implied valve position, or the process error. (The process error is the difference between the PV and SP values.)

ADC Acronym: Analog to Digital Converter

Address One or more integers arranged to identify the location of a device or logical unit of an instrumentation system. In PROVOX systems, address values identify such things as data highway, device, file, card, and channel.

AI Acronym: Analog Input

Alarm Deadband
The amount by which the PV value must return within normal limits for the system to clear an alarm. (For example, if the system activates an alarm as soon as the PV value exceeds 100 percent, but the deadband is 5 percent, the system would not clear the alarm until the PV value drops to 95 percent.)

Alarm Trip Point
The user-defined value at which the system activates an alarm. Such activation occurs as the measured variable moves out of range (for example, going below the trip point for a low alarm).

Algorithm A set of logical steps to solve a problem or accomplish a task. A computer program contains one or more algorithms. Many configurations of PROVOX systems also contain algorithms, particularly in operations, procedures, and function sequence tables.

ALM Abbreviation: Alarm

Alphanumeric Consisting of letters or numbers.

ALU Acronym: Arithmetic Logic Unit

American National Standards Institute (ANSI)
A technical organization that develops standards for the compatibility of industrial equipment. This organization consists of users and manufacturers of such equipment.

American Wire Gauge (AWG)
The usual system of wire size measurement in the United States. A 14 AWG wire has a cross-sectional area of 2.08 mm; a 000 AWG wire has a cross-sectional area of 85.02 mm. Note that the smaller the AWG value, the larger the wire.

Analog Continuously variable over a given range. A process control system senses a physical variable such as voltage, current, or resistance as an analog value.

Analog Input (AI)
A PROVOX point type. An analog input point receives a single analog value, the process variable.

Analog Output (AO)
A PROVOX point type. An analog output point generates a single analog value, the set point.

Analog to Digital Converter (A/D or ADC)
An integrated circuit device that converts analog signals into a digital form. This enables a digital computer to operate on such signals.

ANSI Acronym: American National Standards Institute

Anti-Reset Windup
An additional gain factor, equal to 16 times the integral (reset), applied to controllers to help them recover faster from output saturation, or windup.

AO Acronym: Analog Output

APU Acronym: Arithmetic Processing Unit

Architecture The arrangement and interconnection of the various parts of a microprocessor or computer system.

Arithmetic Logic Unit (ALU)
A circuit component that performs complex mathematical calculations. In effect, an ALU is a very specialized MPU.

Arithmetic Processing Unit (APU)
An electronic device that performs arithmetic calculations using hardware or logic functions, instead of a long series of computer instructions.

ARW Acronym: Anti-Reset Windup

ASCII ***1.*** A standard digital encoding scheme for data: a 7-bit binary code represents numbers, letters, symbols, and control codes. (The designation is an acronym for American Standard Code for Information Interchange.)
2. A PROVOX point type. An ASCII point contains a single real value, referenced by the setpoint attribute, and an 80-character ASCII string.

Assembly (ASSY)
In PROVOX, a collection of hardware and/or PWB modules, or a single PWB module that is built up from individual components.

ASSY Abbreviation: Assembly

Asynchronous Communications Interface Adaptor (ACIA)
1. An integrated circuit that provides data formatting and control for serial asynchronous data communications. Provides an interface between an MPU data bus and external devices that have a serial data format.
2. In PROVOX, an integrated circuit (Motorola 86B50) which is used to interface regulatory controllers to DCUs.

Attribute An individual parameter of a process control point. Also the name of a PROVOX data type.

AUT Abbreviation: Automatic Mode

AUTO Abbreviation: Automatic Mode

Automatic Mode (AUT or AUTO)
A loop or point control mode: the control algorithm changes the control output to minimize the difference between the values of the setpoint and the process variable. An operator supplies the setpoint value.

AUX EU Acronym: Auxiliary Engineering Units

AWG Acronym: American Wire Gauge

B

B&G Acronym: Bias and Gain

Baby N Connector (BNC)
A type of connector for coaxial cable; used for a variety of applications in PROVOX systems.

Batch A specific quantity of a given product, produced in a single complete processing procedure.

Baud The unit of measurement of serial transmission speed for digital data. Baud usually means bits per second, but may have a different meaning if the encoding method used is frequency multiplexing.

BCD Acronym: Binary-Coded Decimal

Bias A value added to a controller input or output, as part of a control strategy. For example, bias can determine the nominal setting of a control valve for a steady-state process.

Bias and Gain A primary control algorithm which calculates its output by adding a bias value to the process variable and then multiplying the result by a gain value. A bias and gain algorithm is often appropriate for maintaining a ratio between two products.

Binary Involving two characteristics, conditions, or possibilities. For example, base-two numbers (numbers that use only the digits 0 and 1) are binary numbers.

Binary-Coded Decimal (BCD)
A digital encoding system for decimal numbers: a set of four binary digits represents each decimal digit, 0 through 9.

Bit (Binary Digit) A single place in a binary number. The only possible values for a bit are 0 and 1.

BNC Acronym: Baby N Connector

British Standards Institute (BSI)
An independent organization that defines industrial and technical standards, used in the United Kingdom and elsewhere.

BSI Acronym: British Standards Institute

Buffer ***1.*** A storage device that compensates for different rates of data flow, or time occurrences of events, when transmitting data from one device to another.
2. An isolating circuit that prevents a driven circuit from influencing the driving circuit.

Bus A general term for a group of signal lines to be considered together, as in a data bus or address bus. The data highway of a PROVOX system is such a bus.

Byte A unit of binary digits (bits). Usually a byte consists of eight bits.

C

Canadian Standards Association (CSA)
A Canadian organization that develops safety standards for industrial equipment and certifies products that meet those standards.

CAP Abbreviation: Capacitor

Capacitor (CAP)
An electronic component that stores electrical energy, blocks the flow of direct current, and permits the flow of alternating current.

CCITT Acronym: Comite Consultatif International pour Telephonie et Telegraphie, or International Consultative Committee for Telephony and Telegraphy. [See International Consultative Committee for Telephony and Telegraphy]

Central Processing Unit (CPU)
The portion of a computer that manipulates and modifies data, carrying out the instructions of the computer program.

CEU Acronym: Continuing Education Unit

CHIP Acronym: Computer/Highway Interface Package

CIA Acronym: Communications Interface Assembly

CIM Acronym: Computer Integrated Manufacturing

CIU Acronym: Computer Interface Unit

CMOS Acronym: Complimentary Metal Oxide Semiconductor

CMPTR Abbreviation: Computer

CNSL Abbreviation: Console

CO Acronym: Current Output

Communications Interface Assembly (CIA)
A printed circuit card that links files of PROVOX devices and the data highway. The CIA provides the timing and data conversion necessary for communications.

Complimentary Metal Oxide Semiconductor (CMOS)
A family of digital integrated circuits that use transistors operating in a push-pull mode to carry out logic functions. A CMOS usually is capable of low-powered operation.

Computer/Highway Interface Package (CHIP)
A PROVOX software product that allows user-written programs to interact with the PROVOX system. There are different CHIP versions, so that any of several types of computers can be the host computer.

Computer Integrated Manufacturing (CIM)
A philosophy of industrial design and manufacture that uses computer-based systems to integrate and coordinate engineering functions, business functions, and factory operations.

Computer Interface Unit (CIU)
A set of cards that acts as a protocol converter to the CCON, BCON, or CCOMP, to interface with the PROVOX data highway.

CONFIG Abbreviation: Configuration

Configuration (CONFIG)
Giving instructions and supplying reference information to the controllers and other devices that make up a process control instrumentation system. For some PROVOX systems, configuration consists of responding to prompts in a series of console screen displays. For other PROVOX systems, configuration consists of creating and manipulating special ASCII text files.

Controller A device that operates automatically to regulate a controlled variable.

Controller Algorithm
A mathematical representation of a control action to be performed.

Control Algorithm
A mathematical representation of a control action to be performed.

Control Loop An arrangement of mechanical and electronic components for process control. A product flows through one or more mechanical components of the loop. The electronic components of the loop continuously measure one or more aspects of the product flow, then alter those aspects as necessary to acheive a desired process condition. A simple control loop measures only one variable. More sophisticated control loops measure many variables and maintain specified relationships between those variables.

Control Room Instrumentation (CRI)
1. Process control equipment designed for installation and operation in a control room environment.
2. A former name for the department at Fisher Controls that designs PROVOX systems. (The current name for this department is Process Instrumentation, or PI.)

Control Sequence
A type of primary control algorithm which provides basic functions such as alarming, data communication, tracking, and error signal calculation, but does not provide any form of control action. This allows the user to create a customized control algorithm transfer function using FST instructions.

CPU Acronym: Central Processing Unit.

CRC Acronym: Cyclic Redundancy Check

CRI Acronym: Control Room Instrumentation

CSA Acronym: Canadian Standards Association

Cyclic Redundancy Check (CRC)
A method of error detection in data transmission and data storage. The check evaluates both the number of ones and zeroes in a block (parity) and the position of the values in the block.

D

D Abbreviation: Derivative Control Action (Rate)

D/A Acronym: Digital to Analog, or Digital to Analog Converter

DAC Acronym: Digital to Analog Converter

Damping Reducing or suppressing oscillation of an output value after a change in the measured signal. When the response to an output change is as fast as possible without overshoot, the response is critically damped. If the response is slower than critical it is overdamped, and if an overshoot occurs the response is underdamped.

Data A general term that denotes any information an MPU can process.

Database A collection of data stored in a systematic way so that searches and sorts are rapid and so that retrieval of items is simple.

Database Index (DBI)
A sequential integer by which a computer or other electronic device finds or keeps track of storage locations in a database.

Data Concentrator
A highway device that collects and consolidates information for configurable, computing, and interactive controllers, interfacing the controllers to the data highway; also known as data concentrator unit (DCU).

Data Group The name for data structures used by certain PROVOX software products. Data groups resemble arrays, but their element values may be of different types. Data group definitions are included in a special configuration source file.

Data Historian (DH)
A Fisher product that collects and manipulates large amounts of process operating data. DH produces graphic trend plots and performs statistical quality-control functions for realtime and archived data. DH layers on CHIP software.

Data Record Analog Output (REC AO)
A multiplexer point type that copies a value from an analog input point in the multiplexer, then outputs the value to a field device. A common use for the REC AO point type is for strip-chart recording.

DBI Acronym: Database Index

DBND Abbreviation: Deadband

DC Acronym: Data Concentrator

DCD Acronym: Discrete Control Device

DCD Template A collection of up to 16 set points defined for a DCD point during configuration. Each set point consists of an input bit pattern and an output bit pattern for the DCD's discrete I/O channels. A DCD template makes it possible for the same DCD point to use different combinations of channels at different times, and also allows multiple DCD points to use the same set points by referencing a common DCD template.

DCP Acronym: Direct Control Point

DCPC Acronym: Dual Channel Port Controller

DCU Acronym: Data Concentrator Unit (same as data concentrator)

DDC Acronym: Direct Digital Control

DDP Acronym: Detail Display Parameter

Deadband [See Alarm Deadband]

Derivative Action
Another name for derivative control action.

Derivative (Rate) Control Action (D)
Control action in which the change in the output signal is proportional to the first time derivitive (rate of change) of the input signal. Rate action is another name for derivative control action.

DESCR Abbreviation: Descriptor

Deviation Usually, the difference between setpoint and process variable. More generally, any departure from a desired or expected value or pattern.

Deviation Alarm
An alarm that signals a specified amount of difference exists between two monitored values; usually the process variable and the set point.

Device A piece of electronic hardware that performs one or more prescribed functions.

DH Acronym: Data Historian

DI Acronym: Discrete Input

Diagnostics One or more programs in a computer or microprocessor that can detect and pinpoint a configuration error or a hardware fault. Also, the utility or functionality such programs add to a product.

Digital to Analog Converter (DAC or D/A)
An electronic circuit (usually an IC) that converts a digital signal (digital data) into an analog signal of corresponding value.

Digital Signal Processing
The arithmetic processing (such as filtering or amplification) of real–time signals which are sampled at regular intervals and digitized.

Digital Volt Meter (DVM)
A test instrument that measures voltage, current, or resistance, and gives numerical readings.

DIO Acronym: Discrete Input/Output

DIP Acronym: Dual In-line Package

Direct Control Point (DCP)
A regulatory controller point type which provides control for continuous processes. A DCP is a collection of setpoint, process variable, and valve position values along with tuning parameters for a control loop.

Direct Digital Control Mode (DDC)
A loop control mode: a process-control computer or a computer program, a unit point, or a logic control point directly sets the output of a control loop.

Direct Memory Access (DMA)
A method of directly transferring data in and out of memory. DMA is used when a device can transmit data faster than a CPU can input the data and store it in memory. A DMA controller is used to control the storage of data into memory instead of the CPU. This permits a very fast data transfer rate.

Discrete Having either of two states, for example, on or off, or 1 or 0.

Discrete Control Device (DCD)
A PROVOX point type. A DCD point combines as many as 8 discrete output and 16 discrete input channels into a single point. A DCD point uses a DCD template which contains up to 16 setpoints for driving outputs and matching input/output states. A common use for a DCD point is to control a discrete device that provides feedback about its status, such as a solenoid valve with limit switches.

Discrete Input (DI)
A PROVOX point type. A DI point monitors a single discrete value of the process variable. That is, a DI point reads discrete data from a sensor or other system device.

Discrete Input/Output (DIO)
The reception and transmission of discrete signals. In PROVOX systems, DIO usually refers to a discrete input/output card in a controller.

Discrete Output (DO)
A PROVOX point type. A DO point generates a single discrete value referenced by the setpoint.

DMA Acronym: Direct Memory Access

DO Acronym: Discrete Output

Download To transfer configuration instructions and reference information from a configuration device to other devices of a process control system.

DSP
1. Abbreviation: Display
2. Acronym: Distributed Systems Products
3. Acronym: Digital Signal Processing

DSR Acronym: Direct Screen Reference

Dual Channel Port Controller (DCPC)
A device that controls direct memory access within the Hewlett Packard computer family.

Dual In-line Package (DIP)
An integrated circuit packaging method that allows for two rows of conductors spaced at least 0.3 inch (7.6 mm) apart with each conductor in the row spaced on 0.1-inch (2.5 mm) centers.

DVM Acronym: Digital Volt Meter

DW Acronym: Display Write-RAM (for PCON)

E

EAROM Acronym: Electrically Alterable Read-Only Memory

EDAS Acronym: Extended Data Acquisition System

EIA Acronym: Electronic Industries Association

Electrically Alterable Read-Only Memory (EAROM)
A type of semiconductor memory device, electrically erasable and reprogrammable, that is used primarily for read-only information.

Electronic Industries Association (EIA)
A group of electronic manufacturers that creates industry standards for communication between electronic devices. Among these standards are RS-232 and RS-449.

Electromagnetic Interference (EMI)
The general category of electrical noise induced by radio frequency and magnetic, electrostatic, or capacitive coupling.

Electrostatic Damage (ESD)
Deterioration of integrated circuits due to high levels of static electricity. Symptoms of ESD include degradation of performance, device malfunction, and complete failure.

EMI Acronym: Electromagnetic Interference

ENB Abbreviation: Enable

ENBL Abbreviation: Enable

Engineering Units (EU)
The range of measurement for an analog process variable. The low (0 percent) and high (100 percent) engineering unit limits define the anticipated range of the variable. For example, low and high engineering-unit values of 50 and 1550 might define a range for degrees Fahrenheit. In this example, the EU span would be 1500 degrees; each percent of the EU span would equal 15 degrees.

Engineering Units Descriptor
The name of the units an engineering units value represents. Possible examples include ***MTRS*** for ***meters***, ***LB/SQIN*** for ***pounds per square inch***, and ***DEGSCEL*** for ***degrees celsius***.

Engineering Units High Value (EUHV)
Former name for High Engineering Units Scale Factor (HIEC).

Engineering Units Low Value (EULV)
Former name for Low Engineering Units Scale Factor (LOEC).

ENVOX Trademark for Fisher Controls' product line of advanced configuration devices for certain process control systems. The use of a third-party relational database is the principal distinguishing feature of configuration with an ENVOX device.

EOT Acronym: End of Transmission

EPCI Acronym: Extended Pulse Count Input

EPROM Acronym: Erasable Programmable Read-Only Memory

Erasable Programmable Read-Only Memory (EPROM)
A semiconductor memory device that is programmable electrically, but erasable only by exposure to high-intensity ultraviolet light.

ERR Abbreviation: Error

Error Signal In a closed loop, the difference between the actual value of a particular signal and its desired value (usually PV and SP).

Error-Squared PI_PID
A type of primary control algorithm which is similar to a normal PI_PID algorithm, but acts on the square of the error signal (where the sign of the error signal is retained) instead of the normal error signal value.

ESD Acronym: Electrostatic Damage

Ethernet Xerox trademark for a local area network communication scheme via coaxial cable. The scheme permits multiple access with collision detection, and arbitrates the use of a 10 Megabit-per-second baseband. Ethernet conforms to IEEE standard 802.3.

EU Acronym: Engineering Units

EUHV Obsolete acronym: Engineering Units High Value (replaced by HIEC: High Engineering Units Scale Factor)

EULV Obsolete acronym: Engineering Units Low Value (replaced by LOEC: Low Engineering Units Scale Factor)

EXP Abbreviation: Expected

Expression A mathematical phrase which is used in a unit operation. An expression always follows the sequence of ***operand-operator-operand***.

EXT Abbreviation: Extended or External In PROVOX, EXT usually refers to an External Interface card.

Extended ac^2 A multiplexer point type that monitors signals associated with Fisher Controls **ac^2** 100 instrumentation, and also allows an operator of a console or other PROVOX highway device to adjust the **ac^2** SP value.

Extended Analog Input
A multiplexer point type that accepts an analog signal from a field device, and can apply a first-order filter, square-root conversion, or thermocouple conversion before passing the value to the data highway.

Extended Analog Output
A multiplexer point type that receives an analog value from the data-highway, then converts that value to an analog signal which is sent to a field device. Should the expected value not arrive over the highway, the algorithm sends a default signal to the field device.

Extended Discrete Output
A multiplexer point type that receives a discrete value from the data-highway, then converts that value to a discrete signal which is sent to a field device. Should the expected value not arrive over the highway, the algorithm sends a default signal to the field device.

Extended Functions
Optional capability that can be enabled for certain point types, increasing the number of functions the point can perform. Common extended functions are pressure/temperature compensation, signal characterization, and extended alarms.

Extended Pulse Count Input (EPCI)
A PROVOX point type. An EPCI point reads a series of electronic pulses or switch closures as an unsigned, 16-bit integer value, then calculates accumulation and rate values.

F

Faceplate An established display figure that shows the most important information about a process control point. Faceplates are vertical rectangles, several of which fit on a console screen at once.

FDFWD Acronym: Feedforward

Feedforward (FF or FDFWD)
A type of control action that takes into account signals other than the process variable, in order to anticipate and minimize deviations of the process variable.

FF Acronym: Feedforward

FIFO Acronym: First In, First Out

FIL Abbreviation: Filter

Filter Time Constant (FTIM)
The length of time required for 63.21 percent of a step change at the input of a filter to appear at the output.

Firmware Computer or microprocessor programming stored in an integrated circuit, in such a way that users cannot change the programming.

First In, First Out (FIFO)
An order for handling or processing items placed in a queue or buffer. The first item placed in the queue or buffer is the first item retrieved for use. [See Last In, First Out (LIFO)]

Fixed Gain (K) A multiplication factor for a process control value. System or device configuration establishes the amount of this factor. A user cannot change a fixed gain without reconfiguring.

FST Acronym: Function Sequence Table

FTIM Acronym: Filter Time Constant

Full Duplex Communication
Simultaneous transmission in both directions over a communications channel.

FWD Abbreviation: Forward

G

Gain The ratio of output change to input change in a controller. The amount of gain determines how much the controller output initially changes in response to process deviations.

H

Hard Manual Mode (HMAN)
A special control mode associated with controller backup: in some Fisher systems, if a controller fails, additional hardware lets the operator retain manual mode control of the loop output.

Hexadecimal A base 16 number system commonly used in digital computers. It consists of the numbers 0 through 9 followed by the letters A through F, where A corresponds to a decimal (base 10) value of 10 and F corresponds to a decimal value of 15.

HIEC High Engineering Units Scale Factor

High Engineering Units Scale Factor (HIEC)
A floating-point number that represents the upper limit (100 percent) of the anticipated range of an analog process variable.

High-Low Signal Selector
A type of primary control algorithm that accepts as many as four analog input values, then selects the highest or lowest value to be the output value. (The operator determines whether the algorithm selects the highest or lowest value.)

I

I Abbreviation: Integral (Reset)

IAC Acronym: 1. (adjective): interactive. 2. (noun) interactive controller

IC Acronym: Integrated Circuit

ICA Acronym and IBM trademark: Industrial Control Architecture

IEEE Acronym: Institute of Electrical and Electronics Engineers

Implied Valve Position (IVP)
The output of a primary control algorithm (PCA). The IVP normally determines how much to open a valve actuator, which moves to the appropriate position. Note that if the IVP is modified by a station function or FST after being computed by the PCA, the valve output and the IVP will not be the same.

IND Abbreviation: Indicator

Industrial Control Architecture (ICA)
A group of basic principles that guided the design of several IBM computers. The acronym ICA is an IBM trademark.

Input/Output (IO or I/O)
Signal reception and transmission, or signal interfacing. Input, for a process control device, involves accepting and processing signals from field devices. Output, for a process control device, involves converting commands into electrical signals to field devices.

Institute of Electrical and Electronic Engineers (IEEE)
An independent technical organization that defines standards for the electrical, electronic, and computer industries.

Instrument Society of America (ISA)
A professional organization of designers, manufacturers, and users of process control instrumentation.

Integer ***1.*** Any positive or negative natural number, or zero.
2. A PROVOX point type. An integer point reads a series of electronic pulses or switch closures, receives a 16-bit unsigned integer input value, or generates a 16-bit integer output value. An alternate name for integer point is pulse count input (PCI) point.

Integrated Circuit
A circuit element that incorporates transistor, diode, and resistor elements in the same semiconductor chip.

Integrated Function Controller (IFC)
An advanced function controller of the UOC family, that provides multiloop continuous control capability with interlocking and sequencing through the use of FSTs and LCPs.

Inter-Driver Link (IDL)
A physical and logical connection between the I/O drivers of two controllers, for transporting configuration and operating data between the active and backup controller.

International Consultative Committee for Telephony and Telegraphy (CCITT)
A technical organization that develops compatibility and other recommendations for telecommunication, including data communication. (The acronym comes from the organization's French name.)

International Standards Organization (ISO)
An official body that develops standards for data communication and interconnection of different manufacturers' equipment.

Interrupt Signal
A signal that notifies the MPU that some event has occured. In many systems, the interrupt signals have different priorities, and an interrupt priority control circuit sends the signals to the MPU.

IO or I/O Acronym: Input/Output

I/O Channels Input/output channels: communications paths from a device to a communications link or other device.

ISA Acronym: Instrument Society of America

ISO Acronym: International Standards Organization

K

K Symbol: Fixed Gain

KB Abbreviation: Keyboard

L

LAN Acronym: Local Area Network

Last In, First Out (LIFO)
An order for handling or processing items placed in a queue or buffer. The last item placed in the queue or buffer is the first item retrieved for use. A LIFO queue is often called a ***stack***. [See First In, First Out (FIFO)]

LD Acronym: Local Device

Least-Significant Digit (LSD)
The lowest-value position of an integer; used in the control panel of certain products.

LED Acronym: Light-Emitting Diode

LIFO Acronym: Last In, First Out

Light-Emitting Diode (LED)
An electronic component that generates a small focused beam of light, in response to a current passing through. LEDs are available in several colors, depending on the type of crystal they contain.

LM Abbreviation: Limit

LO Abbreviation: Low

Local Area Network (LAN)
A group of electronic devices that are relatively close to each other (usually less than two miles apart) and communicate with each other using a frequency range of several megaHertz. LAN communication includes a switching capability. An LAN has inexpensive communication media, such as coaxial or twisted-pair cable; usually the owner of the electronic devices also owns the communication media.

Local Device (LD)
Any PROVOX device that resides on a local highway and therefore communicates directly with a local traffic director.

Local Ground Point (LGP)
A central termination point for all signal common and power supply common circuits within a cabinet group of eight or fewer bays.

Local Traffic Director (LTD)
A communications device that controls the data flow on a local data highway. As many as 30 devices can be on the highway. An LTD also stores and forwards messages to other local areas.

LOEC Low Engineering Units Scale Factor

Log A summary of process operation data, especially a list of significant events and the times at which they occurred.

Logical Unit (LU)
A conceptual entity that has no real physical existence. A common logical unit is a computer file: the data that makes up the file is stored in some physical device, but not necessarily contiguously. Users of PROVOX systems define points and other logical units as part of system configuration; such logical units may have reserved portions of a hard-disk storage device for their data.

Low Engineering Units Scale Factor (LOEC)
A floating-point number that represents the lower limit (0 percent) of the anticipated range of an analog process variable.

LR Acronym: Link Read-ROM (for PCON)

LSD Acronym: Least Significant Digit

LSP Acronym: Last Setpoint

LTD Acronym: Local Traffic Director

LW Acronym: Link Write-RAM (for PCON)

LU Acronym: Logical Unit

M

Maintenance A PROVOX point type. A maintenance point indicates integrity of a system device to the system operator.

MAN Abbreviation: Manual Mode

Manual Mode (MAN)
A loop control mode: the operator directly sets the output of a control loop.

Master Ground Point (MGP)
A common termination point for as many as six local ground point (LGP) assemblies.

MAX Abbreviation: Maximum

MCA Acronym and IBM trademark: MicroChannel Architecture

Measured Variable (MV)
A physical quality or quantity which is monitored as part of a control strategy. Common measured variables are temperature, level, and rate of flow. The term ***process variable*** is a synonym.

Memory A computer's storage for programs and data. Most computers and microprocessors have both internal and external memories: use of internal memories is usually faster, but the capacity of internal memories is more limited. Internal memories are usually ROM or RAM; external memories are usually disk or tape drives.

MGP Acronym: Master Ground Point

Microprocessor A complex integrated circuit that can be programmed to perform different tasks.

Microprocessor Unit (MPU)
A general-purpose integrated circuit that performs the functions of the central processing unit (CPU) of a computer.

MIN Abbreviation: Minimum

Mode Identification of who or what controls changes to certain types of point data. Point data may potentially be changed by a human operator, a controller algorithm, a computer, and another point. Each mode determines which of these is allowed to change point data. The seven possible modes in a PROVOX system are: ***manual, automatic, remote set point, supervisory, direct digital control, computer,*** and ***hard manual***.

Modem Modulator/demodulator: a device that allows a computer to transmit and receive data via a telephone or other communications network.

Monitor A PROVOX point type. A monitor point is used to retain a single analog or discrete value. Analog monitored values are typically displayed on a console display as a PV bar graph. In a monitor point, the device containing the point is allowed to read or write the value and other system devices are only allowed to read the analog value.

Most-Significant Digit (MSD)
The highest-value position of an integer; used in the control panel of certain products.

Motorola, Inc. A manufacturer of electronic components and microprocessors. PROVOX devices use many Motorola integrated circuits and MPUs, including 8-bit (MC6809) and 16-bit (MC68000 and MC68010) machines.

MPU Acronym: Microprocessor Unit

MSD Acronym: Most Significant Digit

Multiple Variable
Multivariable

Multiplexer (MUX)
A PROVOX highway device that transfers information between the data highway and field devices (both analog and discrete).

Multiplexer Analog Input (MUX AI)
A PROVOX point type, available from the multiplexer. A MUX AI point consists of a single analog value that represents the voltage or current signal of a multiplexer analog input channel.

Multiplexer Analog Output (MUX AO)
A PROVOX point type, available from the multiplexer. A MUX AO point consists of a single analog value, provided by a console operator or a system device, that appears as the voltage or current of a multiplexer output.

Multiplexer Discrete Input (MUX DI)
A PROVOX point type, available from the multiplexer. A MUX DI point consists of a single-bit digital value that represents the signal present at a multiplexer discrete input channel.

Multiplexer Discrete Output (MUX DO)
A PROVOX point type, available from the multiplexer. A MUX DO point consists of a single-bit digital set point, provided by a console operator or a system device which appears at a multiplexer discrete output chanel.

Multiplexer Pulse Count Input (MUX PCI)
A PROVOX point type, available from the multiplexer. A MUX PCI point is a single value, from 0 to 65535, representing the number of discrete pulses received at a multiplexer pulse count input channel.

MUX Abbreviation: Multiplexer

MUX AI Acronym: Multiplexer Analog Input

MUX AO Acronym: Multiplexer Analog Output

MUX DI Acronym: Multiplexer Discrete Input

MUX DO Acronym: Multiplexer Discrete Output

MUX PCI Acronym: Multiplexer Pulse Count Input

MV Acronym: Measured Variable or Multivariable

MVP Acronym: Multivariable Point

N

NAK Acronym: Negative Acknowledgement

NC Acronym: Normally Closed

ND Acronym: Network Device

Negative Acknowledgement (NAK)
A control signal that reports the reception of a data block with errors. This usually triggers automatic retransmittal of the data block.

Network Device (ND)
A PROVOX device that communicates directly with a network traffic director. An network device can be any device, but usually is one that collects information from several local highways. Local traffic directors, consoles, and trend units are common network devices.

Network Interface Unit (NIU)
A device that lets a computer communicate with other devices of a PROVOX instrumentation system, via the system's data highway.

Network Traffic Director (NTD)
A PROVOX device that controls the data flow for the network data highway. The NTD links network devices and local data highways via the local traffic directors.

NIU Acronym: Network Interface Unit

NO Acronym: Normally Open

Non-Volatile Memory (NVM)
A type of semiconductor memory that retains its contents even though power is disconnected.

Normally Closed (NC)
Said of a contact pair closed (conducting) when its device or relay coil is not energized. Such a contact pair also is called a break contact.

Normally Open (NO)
Said of a contact pair open (not conducting) when its device or relay coil is not energized.

NTD Acronym: Network Traffic Director

NVM Acronym: Non-Volatile Memory

O

OAL Acronym: Operator Attention List

OAR Acronym: Operator Action Request

OCC Abbreviation: Occurrence

Octal Involving eight characteristics, conditions, or possibilities. For example, octal numbers (0 through 7) have the base (radix) 8.

OEM Original Equipment Manufacturer

On/Off Controller
A controller that has only discrete output values: on or off.

OP AMP Acronym: Operational Amplifier

Operand ***1.*** In a function sequence table, a value that modifies or qualifies a function.
2. In ASCII configuration source files, an expression, a simple operand, a phrase list, or an operand list.

Operand List In ASCII configuration source files, two or more operands separated by commas.

Operating System
The software that controls and supervises all the internal operations of a computer.

Operational Amplifier (OP AMP)
A high-gain, linear, DC amplifier, typically an integrated circuit, used in a wide variety of applications.

Operation [See Unit Operation]

Operator Action Request (OAR)
A notice of operator action required before an operation can continue. OARs appear in the faceplate for a unit point and in the OAL, in a format similar to that of alarms.

Operator Attention List (OAL)
A one-line console message that alerts the operator to displays that have points in alarm, batch units that require information, console errors, or communications problems.

Operator Station
A local control station that can be connected to regulatory controllers. An operator station displays mst of the same information that appears in a faceplate display, and gives basic control over a control loop.

Optical Isolation
The technique of electrically isolating two circuits by converting an electrical signal to an optical signal and back again. Optical isolators commonly consist of an LED and a phototransistor mounted in a DIP.

Original Equipment Manufacturer (OEM)
The firm that makes a product sold by another firm. For example, Hewlett Packard is the OEM for some products sold by Fisher Controls.

OT Acronym: Output Tracking

OUT Abbreviation: Output Signal

Output Signal (OUT)
A signal produced by a device, often per a program instruction or command, and typically used as the input to a different device.

Output Tracking
A technique commonly used in override or cascade control applications where an analog value read fron the track signal value input of a controller is substituted for the IVP value calculated by the PCA.

Overwrite To write data to a memory that already contains information, replacing that information with new information.

P

P Abbreviation: Proportional Control Action (Gain)

Packet (PKT) A block of data, or message, handled by a communications network in a well-defined format. Packets in PROVOX systems include headers and maximum sizes of their data fields.

PAL Acronym: Programmable Array Logic

Parallel Simultaneous: said of data transmission on two or more channels at the same time.

Parallel Discrete Output (PDO)
A PROVOX point type. A PDO point generates values for as many as 16 discrete output channels, in the form of a binary value (0-65535) or binary-coded decimal value (0-9999). A common use for a PDO point is to control a hardware device that requires multiple discrete signals.

Parallel Interface
A data transmission device that provides a channel for each bit of a byte, thus permitting simultaneous transmission of all the bits.

Parallel Interface Adapter
An integrated circuit device that provides a number of parallel discrete input and output signals that can be controlled by the address and data signals of an MPU.

PARAM Abbreviation: Parameter

Parity Check A test for errors in transmitted data: checking whether the number of ones (or zeros) in an array of binary digits is odd or even.

PB Acronym: Proportional Band

PC Acronym: Printed Circuit, Programmable Controller, or Personal Computer

PCI Acronym: Pulse Count Input

PCIU Acronym: Programmable Controller Interface Unit

PD Acronym: Proportional/Derivative Control Action

PDM Acronym: Parallel Discrete Monitor

PDO Acronym: Parallel Discrete Output

Percent of Span
A scheme for indicating very large or very small values as simple percentages. The span is a range of values defined for a specific situation. The user establishes the limits of the range as low (0 percent) and high (100 percent) engineering-unit values. A percent-of-span value is a percentage of the difference between these limits.

Periodic A type of unsolicited data reporting: the sending device sends data at a fixed rate, whether or not that data has changed since the last transmission.

Peripheral Interface Adapter (PIA)
An integrated circuit device that provides a number of parallel discrete input and output signals that can be controlled by the address and data signals of an MPU.

PFR Acronym: Power Fail Restart

PI Acronym: Proportional/Integral Control Action or Process Instrumentation

PIA Acronym: Parallel Interface Adapter or Peripheral Interface Adapter

PID Acronym: Proportional/Integral/Derivative Control Action

PI_PID_I Acronym: Proportional/Integral—Proportional/Integral/Derivative Control Action

PIO Acronym: Process Input/Output

PKT Abbreviation: Packet

Plant Management Area (PMA)
A collection of plant process areas (PPAs). A PMA controls the console point reporting load, and indirectly, central processing unit (CPU) loading.

Plant Process Area (PPA)
Within a process-control system, a collection of equipment that uses a common alarm strategy.

PMA Acronym: Plant Management Area

Point A set of process-control parameters and data. The makeup and structure of each point depends on its role in collecting and reporting data and the type of device in which the point resides. Points are the most important logical units of a process control system; the number of points is one measure of a system's size and sophistication.

Port A communications terminal of a regulatory controller card file. Each port is dedicated to the reporting of one controller. Consequently, port numbers identify particular controllers.

Power Fail Restart (PFR)
The actions of a device upon the loss and subsequent restoration of operating power.

Power Supply Common (PSC)
The negative terminal of the 24- volt system power supply: a reference for digital signals.

Power Supply Unit (PSU)
In a PROVOX instrumentation system, a device or component that converts standard alternating current to the direct current voltage that other system devices need.

P_PD Acronym: Proportional—Proportional/Derivative Control Action

PRI Abbreviation: Primary

Printed Circuit (PC)
A conduction path of metal on a substrate material which is used to carry signals between electronic components.

Printed Wiring Board (PWB)
A board containing printed circuits (printed wiring) which serves as the mounting base for integrated circuits and other electronic components.

Procedure A time-and-event sequence, with corresponding product data, used as part of a program for the manufacture of the product.

Process **1.** A collection of physical devices and methods used in the production or manufacturing of a product.
2. A subdivision of a procedure defined for batch tracking or operator intervention at the batch cycle control level. A process in a procedure normally corresponds to a stage of a multi-stage production process.

Process Input/Output (PIO)
The name of an interactive controller circuit card that accepts analog input signals, performs A/D and D/A conversions, and generates analog output signals.

Process Instrumentation (PI)
The department of Fisher Controls that designs and manufactures PROVOX and UNIVOX systems.

Process Variable (PV)
A physical quality or quantity which is monitored as part of a control strategy. Common process variables are temperature, level, and rate of flow. The term ***measured variable*** is a synonym.

Product Data A list of amounts, ingredients, loop setpoints, and so forth, that can be altered to produce variations in product or grade.

PROFLEX The trademark for Fisher Controls' line of configuration devices for certain process control systems. ASCII text files are the principal distinguishing feature of configuration via a PROFLEX device.

Programmable Array Logic (PAL)
A type of semiconductor device that can be used in place of many individual integrated logic gates. A user can program the PAL device with a complete logic pattern.

Programmable Controller Interface Unit (PCIU)
A PROVOX highway device that permits programmable controllers to receive and respond to commands from other PROVOX devices such as consoles, trend units, and UOCs, via the data highway.

Programmable Logic Controller (PLC)
A microprocessor or mini-computer system able to perform simple analog and discrete control. PLC's were developed as replacements for relay control panels, and are typically used for motor control.

Programmable Read-Only Memory (PROM)
A chip programmable only by means of a special device; once programmed in this way, it becomes a ROM.

Programmable Serial Interface (PSI)
The printed wiring board that fits into a Hewlett Packard computer, interfacing the computer and I/O peripherals that use serial data transmission.

PROM Acronym: Programmable Read-Only Memory

Proportional Band
The change of input required to produce a full-range change in output, due to proportional control action. (The reciprocal of gain.)

Protocol A set of data formats and transmission rules for communication between electronic devices. Devices that conform to the same protocol can communicate accurately.

PROVOX Trademark for Fisher Controls' product line of advanced process control equipment: distributed microprocessor-based control and data acquisition devices that communicate with operator consoles over a data highway.

PROVUE Trademark for Fisher Controls' line of console products that use a global database configuration and have high-resolution graphics, ergonomically designed keyboards, and color printers.

PSC Acronym: Power Supply Common

PSI Acronym: Programmable Serial Interface

PSU Acronym: Power Supply Unit

PT Abbreviation: Point

Pulse Count Input (PCI)
A PROVOX point type. A PCI point either reads a series of electronic pulses or switch closures or receives a 16-bit unsigned integer in the range 0-65535. (Many sensors or other field devices transmit information as a series of pulses or contact closures.) An alternate name for PCI point is integer point.

PV Acronym: Process Variable

PWB Acronym: Printed Wiring Board

PWR Abbreviation: Power

Q

QLD Acronym: Question List Display

R

Radio, Electronic, and Television Manufacturers' Association (RETMA)
A group of electronic manufacturers who developed a standard for rack mounting of electronic equipment.

Radio Frequency Interference (RFI)
Inadvertently transmitted energy that falls in the frequency band of radio signals. If this energy is sufficiently strong, it can influence the operation of electronic equipment.

RAM Acronym: Random-Access Memory

Random-Access Memory (RAM)
A type of semiconductor memory. A user can read from and write to a RAM as often as desired.

RAT Abbreviation: Ratio

Rate Another name for derivative control action.

Ratio A proportion that a controller maintains between the values of two variables, as part of a control strategy. The ratio is usually defined as a tunable value during configuration of the controller so that it may be adjusted on-line.

RCV Abbreviation: Receive

Read-Only Memory (ROM)
A memory in which information is stored permanently. A user can examine ROM contents as often as desired but cannot change the contents.

Read/Write Memory (RWM)
Another name for random access memory (RAM).

REC AO Acronym: Data Record Analog Output

Reference Register
A type of register used in an FST or a calculation. A reference register can be written into or read by other PROVOX system devices, but the device containing the register can only read its value.

Register A memory location for temporary storage of a value.

REQ/RESP Acronym: Request/Response

Reset **1.** To return the MPU and any associated circuits to their starting states.
2. The name given to a button a user pushes for such a reset, or to a signal directing such a reset.
3. Another name for integral control action.

Resistance Temperature Detector (RTD)
A device or element that measures process temperature very accurately. RTDs sense temperature changes by measuring the resistance of a coiled metal wire, typically platinum.

Restart To re-power a device of a PROVOX system.

RETMA Acronym: Radio, Electronic, and Television Manufacturers' Association

Reverse Acting Said of a control action in which the absolute value of the output signal decreases as the absolute value of the input signal (process variable) increases.

RFI Acronym: Radio Frequency Interference

RMP Abbreviation: Ramp

ROM Acronym: Read-Only Memory

RST Abbreviation: Restart

RTD Acronym: Resistance Temperature Detector

RTE Acronym: Real Time Executive

RWM Acronym: Read/Write Memory

S

SAMA Acronym: Scientific Apparatus Makers Association

SC Acronym: Signal Common

Scan Sequential interrogation of devices or points.

Scientific Apparatus Makers Association (SAMA)
A trade association that develops standards for symbology, terminology, and procedures within the chemical and process control industries.

SDLC Acronym: Synchronous Data Link Communication

SEC Abbreviation: Secondary

SEL Abbreviation: Select or Selector

Serial Sequential: said of data transmitted one bit after another.

Serial Interface A data transmission device through which bits are sent sequentially.

Serial Interface Unit
A device that lets a computer communicate with other devices of a PROVOX instrumentation system, via the data highway.

Service Transfer Unit (SVXFR)
A stand–alone maintenance product which maintains the current output to a final control element during the replacement of regulatory controller cards.

Settling Time The time required, following a process disturbance or set point change, for a controller's output value to return to a steady state condition.

SGP Acronym: Shield Ground Point

Shield Ground Point (SGP)
A copper bus bar that fits in horizontal cable trays in a system cabinet. This bar is a convenient place to ground signal cable shields.

Signal Common (SC)
A ground point that provides a reference for analog input and analog output signals in a PROVOX system. System installers should reference all other DC wiring to power supply common (PSC).

SIU Acronym: Serial Interface Unit

Software Microprocessor or computer programs and routines that reside in alterable memory (usually RAM or magnetic media), as opposed to firmware, which consists of programs and routines that are programmed into an integrated circuit.

Source File An ASCII-text configuration file that contains definitions of one or more system hardware devices or logical units.

SP Acronym: Setpoint

Span [See Percent of Span]

SQRT Abbreviation: Square Root

SSDA Acronym: Synchronous Serial Data Adapter

ST Abbreviation: Station

STA Abbreviation: Station

Standalone Said of a self-contained system that exists and performs as an autonomous unit.

Standard ac^2 A multiplexer point type that monitors signals associated with Fisher Controls **ac^2** 100 instrumentation.

Standard Analog Input
A multiplexer point type that accepts an analog signal from a field device, then passes the value directly to the data highway.

Standard Analog Output
A multiplexer point type that receives an analog value from the data-highway, then converts that value to an analog signal which is sent to a field device.

Standard Discrete Output
A multiplexer point type that receives a discrete value from the data-highway, then converts that value to a discrete signal which is sent to a field device.

STAT Abbreviation: Station

State [See Operating State]

Station (ST, STA, or STAT)
Definition of the valid control modes for a control loop. Possible modes include manual (MAN), automatic (AUTO), remote setpoint (RSP), supervisory (SUP), and direct digital control (DDC).

SUP Abbreviation: Supervisory Mode

Supervisory (SUP)
A loop control mode: the control algorithm changes the control output to minimize the difference between the values of the setpoint and the process variable. A process computer, a computer program, a unit point, or a logic control point supplies the setpoint value.

SVA Acronym: Signal Value Analog

SVD Acronym: Signal Value Discrete

SVP Acronym: Signal Value Percent

SVXFR Acronym: Service Transfer

SW Abbreviation: Switch

Synchronous Data Link Communication (SDLC)
A protocol for communications between synchronized devices. The protocol features bit-level message frames with error checking.

Synchronous Serial Data Adapter (SSDA)
1. An integrated circuit device that provides a bidirectional serial interface for synchronous data exchange. It contains interface logic for simultaneously transmitting and receiving standard synchronous communications characters.
2. In PROVOX, an itegrated circuit (Motorola 6852) that provides communication between a regulatory controller and an operator station. When an operator plugs a hand-held tuner into the operator station, the SSDA also is the interface to the turner.

T

TC Abbreviation: Thermocouple

TIM Abbreviation: Timer

Transducer A device that converts one physical variable into another.

Transistor-Transistor- Logic (TTL)
A popular family of integrated circuit devices for logic functions. These devices have arrays of bipolar transistors in which voltages below 0.7 volts represent a logical 0, and voltages above 2.4 volts represent a logical 1.

Trip Point [See Alarm Trip Point]

TTL Acronym: Transistor-Transistor Logic

Tuning The adjustment of control terms or parameter values to produce a desired control effect.

U

UDC Acronym: Unsolicited Data Control

UL Acronym: Underwriters Laboratories

Ultraviolet Light Erasable ROM (UVROM)
Another name for ultraviolet read-only memory.

Ultraviolet Read-Only Memory (UVROM)
A special type of ROM. Exposure to intense ultraviolet light erases the ROM contents.

Underwriters Laboratories (UL)
An American agency that tests electrical products, approving those that meet safety guidelines.

Uninterruptible Power Supply (UPS)
A backup device for the AC power source. A UPS connects between the AC power source and computer equipment. Should there be a failure of or interruption in the AC power source, the UPS supplies continuous power to the computer.

Unit ***1.*** A defined group of specific process equipment that processes a particular batch. For control purposes, such a unit is one entity.
2. A PROVOX point type. A unit point has many attributes, enabling it to control the execution of a unit operation.

Unit Operations Controller (UOC)
A PROVOX controller designed for batch, sequencing, discontinuous, and unit-oriented continuous-control applications. A UOC includes FST and LCP functionality.

UNIVOX Trademark for Fisher Controls' line of self-contained process control systems.

UOC Acronym: Unit Operations Controller

Upload The movement of Detail Display Parameters from system devices to a configuration device. An upload lets the current values of parameters be incorporated into existing configuration source files, eliminating user entry specific tuning changes.

UPS Acronym: Uninterruptible Power Supply

UVROM Acronym: Ultraviolet Read-Only Memory or Ultraviolet Light Erasable ROM

V

Valve Output (VO)
A controller voltage or current output that can be used by an actuator to open or close a valve.

VAX Trademark of Digital Equipment Corporation for several lines of the firm's computers; an acronym for Virtual Access eXtension.

VDU Acronym: Video Display Unit

Velocity Limit A restriction on the rate of change of a particular variable.

Video Display Unit (VDU)
An electronic assembly that displays alphanumeric data and graphic images on a screen, for viewing by a user.

VMS Trademark of Digital Equipment Corporation for one of the firm's computer operating systems; an acronym for Virtual Memory System. VMS provides an operating environment for technical applications of VAX computers.

VO Acronym: Valve Output or Voltage Output

Voltage Output (VO)
A terminal, available on a PROVOX controller or multiplexer, that produces a 1- to 5-volt analog output signal.

W

Watchdog Timer (WDT)
1. An electronic timer that generates a priority interrupt unless periodically recycled by a computer or microprocessor. Should the computer or microprocessor fail, it does not recycle the timer, which sends out the interrupt signal, which normally shuts down the system.
2. A regulatory controller software timer used with DCP's operating in DDC or supervisory modes. If the time interval between receipt of DDC or supervisory change requests exceeds the WDT timeout time, the DCP switches to the configured backup mode (Auto or Manual).

WDT Acronym: Watchdog Timer

XYZ

XFR Symbol: Transfer

XMIT Symbol: Transmit

X.25 A CCITT protocol for connecting data terminal equipment to public packet switched networks.

%IVP Symbol: Percent Implied Valve Position

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